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AUGUST—1940

No. 105

COMMITTEE ON PAPERS AND PUBLICATIONS

This committee has authority in all matters affecting the acceptance, rejection, editing and publication of papers, committee reports, and discussions. The committee also acts in an advisory capacity to the Executive Committee in publication matters in general.

ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering and Standardization of Specifications and Methods of Testing"

TELEPHONE—PENnypacker 3545 CABLE ADDRESS—TESTING

Number 105 August, 1940

Notable Annual Meeting with Many Accomplishments

Records Established on New Tentative Standards, Attendance, Committee Meetings

"Seventy-five proposed new standards were accepted for publication as tentative. The total registration of members, committee members, and visitors was 1441. There were 22 formal and several informal annual meeting sessions. Meetings of various technical committees totaled 249. There were 132 technical papers and reports. Informal conferences, business contacts, and "lounge" and "lobby" meetings were innumerable."

While the foregoing paragraph might serve as a very terse description of the Forty-third Annual Meeting of the Society held in Atlantic City, June 24 to 28, inclusive, it does not indicate in any degree the significance of the meeting. When it is realized that the number of new standards to be published as tentative, which in the broad sense represents new work, was the largest number ever acted upon, that the attendance was an all-time high for Atlantic City and second only to the 1937 meeting in New York City with an exhibit, that the number of committee meetings was the highest ever held during any meeting of the Society, then it will be appreciated that this meeting was really outstanding. Obviously, no article in the BULLETIN can portray adequately all of the activities and all of the meeting accomplishments, for the worthwhileness of the meeting is represented not only by the business the Society carries on, but also by the benefits which each member individually derives—some of those things which Mr. Chapman hinted on in his note of acceptance of the award of honorary membership (see another page of this BULLETIN) in which he pointed to lasting friendships, association with leading men in materials engineering and research, and other rewards of participating in the work.

A great deal was accomplished in committee meetings. Some inkling of this is given in the article on standardization activities appearing later in this BULLETIN, much of which takes the form of new work to be discussed in detail in next year's reports, with many of the new specifications, tests and much data to come forward in the future, initiated at these meetings.

There were a number of outstanding technical sessions, and two very pertinent and thought-provoking addresses were presented on the subject of materials standards.

During the meeting, the Society's Third Photographic Exhibit took place and there was an interesting display in the field of radiographic testing sponsored by the Society's Committee E-7.

Actions on Standards and Tentative Standards

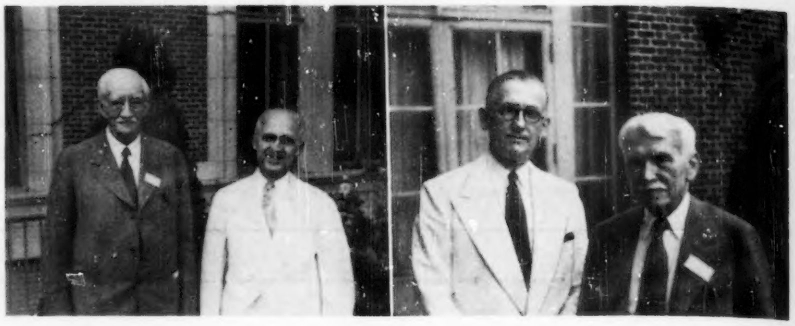
The correct evaluation of the importance and significance of the recommendations on standards and tentative standards is difficult. For instance, one item alone—the new tentative specifications covering portland cement giving requirements for five types of materials—is of much import to the whole cement industry and to the users of cement. The new specifications for factory-made steel welding fittings are significant too—providing standardized requirements for this material which is coming into extensive use. Some similar statement might be made about each of the 75 new or extensively revised tentative specifications accepted at the meeting.

From the table on page 8 summarizing the number of actions taken at the meeting according to the various fields covered, it will be noted that there were upwards of 40 existing tentative standards recommended for adoption as standard and that revisions were approved or adopted in many other standards and tentative standards. It will be seen that the Society will have on its books as of September 3, 1940, close to 940 specifications, tests, and definitions—a net increase of some 55 over 1939.

In a separate mailing there is being sent to each member a letter ballot covering those actions involving the adoption of standards or changes in existing ones, this ballot being accompanied as customary by the *Summary of Proceedings* which gives detailed information on matters covered in the ballot, particularly any changes in reports made at the meeting.

A list of new tentative standards with newly assigned serial designations appears on another page of this BULLETIN, and there is also an article listing the standards which were withdrawn for various reasons, in many cases because of replacement or consolidation with other standards.

New President
W. M. Barr.



Left—The first and fifteenth Edgar Marburg Lecturers, A. N. Talbot and P. H. Bates; Right—The present and the first chairman of Committee C-9, F. H. Jackson and S. E. Thompson.

Meeting Sessions

There was extensive discussion of papers and reports in most of the technical sessions. Considerable interest was noted in the topic, "Tools of Analytical Chemistry," which was the subject of the symposium held on Tuesday afternoon and Wednesday morning and also in the Symposium on Spectrographic Analysis comprising the Fourteenth and Fifteenth Sessions on Thursday.

Committee D-19 on Water for Industrial Uses focused attention on the important problem of classification of natural water intended for industrial use by means of a symposium comprising five papers, and the first of a series of discussion of mechanical tests of metals featured a symposium on the significance of the tension test in relation to design. The second of two sessions in the field of cementitious materials and concrete, Thursday evening, included four technical papers which were discussed at length.

If any individual contributions were to be high-lighted, they certainly would include the presidential address of H. H. Morgan on the subject, "Standard Specifications for Materials and Their Commercial Importance," the address by Lieut. Col. W. C. Young on "Materials Standards in National Preparedness," and the Fifteenth Edgar Marburg Lecture delivered by P. H. Bates on the subject, "Portland Cement—Theories (Proved and Otherwise) and Specifications."

Presidential Address

Before presenting his address, President Morgan spoke informally stressing the fact that "all of the problems of our Society and our membership seem totally insignificant compared with the appalling events of the day. These events will have far-reaching and overpowering effects upon international affairs. With governments being destroyed, our whole civilization may change and our own living standards be vitally affected." He said further, "Ahead of us is a national preparedness program that, in itself, is sure to affect our present living and that of generations to come. Experience has demonstrated and Colonel Young has voiced the need of standardization to effect a state of preparedness sufficient to meet such emergencies as are conceivable. To do this well, to the extent necessary and as economically as possible, standardization of materials, fabrication and, in general, production-line methods must be instituted. It so happens, therefore, that Colonel Young's subject, 'Materials Standards in National Preparedness,' and my own subject, 'Standard Specifications for Materials and Their Commercial Importance,' are especially appropriate at this time. Standards in war preparedness and in commercial transactions are involved. The nearer they are to each other, just so much sooner will our United States be prepared and with the least ultimate burden on our citizenship."

In his address Mr. Morgan indicated that its title said essentially "the importance of having, as an adjunct to a purchase order for the fundamental materials of industry, a definition of the buyers' requirements which is useful in commercial trade." He stated that a good specification provides a means by which the buyer and seller may speak the same language, thus facilitating commerce be-

New Vice-President
H. J. Ball. →

Left—Lieut. Col. Wm. C. Young. (See page 17.)

Right—Nathan C. Rockwood, new chairman of Committee C-7 on Lime.

tween the two, and opening the way for more specific and direct benefits, some of these being as follows: (1) They enable the buyer to get what he wants; (2) the material is of uniform quality; (3) the buyer receives goods more quickly and with less trouble; (4) he has access to wider markets; (5) costs are lower; (6) a suitable acceptance basis is established; (7) material becomes standardized; and (8) research is promoted.

Mr. Morgan stressed the fact that the practical importance of specifications hinges directly on their ability to assure the buyer that he is receiving exactly the goods he orders. In the competition of trade, particularly in regard to heavy products under mass production, it is essential to know that materials are furnished according to specifications.

In stressing the necessity of clearness and completeness in specifications and the desirability of avoiding severe restrictions, he emphasized the important point that limitations which may come from various analyses or tests should be governed strictly by the service desired. "It is *service* that the buyer wants—not a mass of physical or chemical data."

"Clearness, completeness and sane restrictions can be attained only through the joint efforts of buyer and seller. The material has two aspects, both of which must be taken into account—first, the problems of its manufacture; second, its use by the purchaser. Without a clear understanding of both sides, gained only through the cooperation of producer and consumer, incongruities will quite likely appear to wreck all the fondest hopes of the specification writer."

In concluding he stated, "Adequate specifications for materials with competent inspection assure to the buyer a maximum usefulness and serviceability of material at a minimum of cost. The efficiency of any buying organization is measured thereby.

"While a large percentage of buyers cannot maintain the expert personnel or research facilities to write adequate specifications, all want to increase their efficiency. They can do this by utilizing standard specifications, materials, and the facilities afforded by research institutions as well as by using commercial inspection and testing laboratories organized for this purpose."

He said finally, "That the A.S.T.M. specifications are almost universally used in the large field of engineering construction materials is evidence of their commercial importance."

Materials Standards in National Preparedness

In his address (published elsewhere in this Bulletin), Colonel Young in clear and unmistakable terms outlined the significance of industrial mobilization and the importance in this program of adequate materials specifications. He covered such factors as materials needed and quantity, and factors involving production and educational orders as well as production studies, mentioning the careful consideration which has been given to the economic factor. The work of the Munitions Board was covered and particularly the industrial mobilization plan which is a guide to be available in time of a major war. Colonel Young stressed the various specifications issued by Government bodies and pointed to the close cooperation of the War Department and the various Federal departments and also the work of the various technical societies including the A.S.T.M., citing that this organization was in an excellent position to make an important contribution in the field of standardization. He also pointed to the significance of careful inspection of materials. He stated that there are a great number of organizations in the United States actively engaged in standardization work covering many fields. In the event that the nation is faced with a major emergency, it may be expected that activities of these societies and organizations, especially of leading organizations such as the A.S.T.M., will be of great assistance in bringing it to a successful conclusion.

Marburg Lecture on Portland Cement

An outstanding Marburg Lecture was presented by Mr. P. H. Bates, Chief, Clay and Silicate Products Division, National Bureau of Standards, on the subject, "Portland Cement—Theories (Proved and Otherwise) and Specifications." The Lecture was pertinent, not only because it dealt with many aspects of a material of widespread engineering importance, but in particular because of the new specifications for five types of portland cement which were approved by the Society during the meeting.

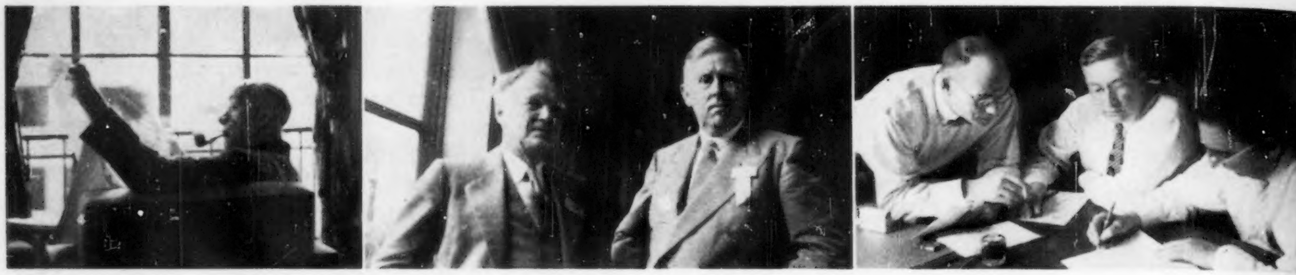
Before delivering the lecture Mr. Bates spoke briefly of his contacts with both Professor Marburg and Doctor Dudley. Of the lecturers so far Mr. Bates is the first to have studied under Professor Marburg at the University of Pennsylvania. Later he worked with Doctor Dudley in the Pennsylvania Railroad Laboratory at Altoona, Pa.

Mr. Bates indicated his feeling of high honor at having been associated with these two men who were the first Secretary-Treasurer and President, respectively, of the A.S.T.M. He paid tribute to Professor Marburg as a great teacher and a capable organizer and executive.

While Mr. Bates' Lecture will appear in the *Proceedings*, printed copies of the Lecture will be available in special form within the next two weeks or so. This item will be listed on the Members' Order Blank sent out late in September, but those who wish to order copies in advance, can obtain them by writing A.S.T.M. Headquarters. A charge of 35 cents each is made to members.

In his Lecture, he pointed first to the difficulty of defining

From left to right: Secretary-Treasurer C. L. Warwick; P. H. Bates, Marburg Lecturer; President H. H. Morgan; T. F. Willis and M. E. De Reus, Dudley Medalists; W. M. Barr, President-elect.



Left to right: H. W. Gillette; P. H. Dike and Vice-President G. E. F. Lundell; R. H. Dibble, E. F. Lundeen, and C. M. Parker.

this material in the ordinary dictionary manner, and mentioned that "the possible best that can be done is to refer to it as largely a mixture of finely ground synthetic highly basic lime silicates with which are present lesser amounts of highly basic lime aluminates, lime alumino-ferrates, and solid solutions of these with (or compounds of) the many adventitious oxides found in clays, limestones, and the other raw materials used in cement manufacture." He covered briefly the history of the material and discussed in some detail the question "What Is Portland Cement?" referring to the various constituents such as tricalcium silicate and the other major constituents. He said that uncertainty still remained as to the nature of the role of the always present so-called minor oxides and indicated his agreement with the plea of Forsen made at the Symposium on the Chemistry of Cements, held in Stockholm in 1938, that terms such as "alite," "belite," and "celite" be used instead of the chemical formulas in terminology. There was discussion of the reactions of cement with water and particular comment on the new specifications for cement in which discussion he covered the question of whether five types were needed.

There was discussion of the degree of grinding (fineness) and the autoclave test. In this latter connection, he felt that "whether or not a high autoclave expansion without question signifies a large expansion in later life is also still to be proven. That the test assures generally a more uniformly and better made cement is without question."

A rapid change in viewpoints on the use of admixtures was cited and that many studies are under way on the effects of various materials.

He said that "accepting cements as they are now produced, there seems to be no brighter prospect of improving these throughout their entire life—from the time they enter the concrete mixer until progress in the course of time completes the abandoning or demolishing of the structure into which they entered—than through the use of admixtures. The happening upon the effect of a few admixtures of a 'froth' producing nature in increasing the life of concrete highways justifies a vigorous search for others possible of enhancing other qualities of cement."

Mr. Bates referred to five interesting tests developed in recent years for use in accepting cement, stating that the trial of these methods should be done in an open-minded manner. He mentioned Merriman's test for determining resistance to sulfate waters and also his "sugar" test for ascertaining the degree or completeness of burning of the clinker. He also commented on the "floc" test and autoclave test of cement clinker, both of these being developed by Ira Paul. He mentioned the test developed by T. E. Stanton of the California State Division of Highways in fixing permissible amounts of alkali.

Throughout the Lecture, Mr. Bates stressed the need of additional research on many problems and at one point stated that the new tentative specifications were a striking outline of needed active work. Even though they are good purchase specifications they do provide a good outline of research. His concluding sentence follows: "But the fact that it is certain that there are still many uncertainties regarding the true nature of portland cement, how it reacts with water and how it will deport itself under certain trying conditions in no way detracts from the proven findings of its tremendous use that the results are startingly satisfactory."

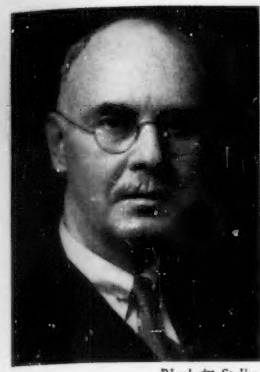
Dudley Medal Award; Thompson Award

The fourteenth award of the Charles B. Dudley Medal and the first Sanford E. Thompson award, the latter established by Committee C-9 on Concrete and Concrete Aggregates, were made to T. F. Willis and M. E. De Reus, Research Engineer and Junior Engineer, respectively, Bureau

(*Continued on page 11*)

SUMMARY OF ACTIONS TAKEN AT ANNUAL MEETING AFFECTING STANDARDS AND TENTATIVE STANDARDS.

	Existing Tentative Standards Adopted as Standard	Standards in Which Revisions Will Be Adopted	New Tentative Standards	Proposed Revisions of Existing Standards Accepted as Tentative	Existing Tentative Standards Revised	Standards and Tentative Standards Withdrawn or Replaced	Present Total Standards Adopted	Present Total Tentative Standards
A. Ferrous Metals—Steel, Cast Iron, Wrought Iron, Alloys, etc.	9	22	6	6	11	4	133	42
B. Non-Ferrous Metals—Copper, Zinc, Lead, Aluminum, Alloys, etc.	5	7	14	..	20	6	52	72
C. Cement, Lime, Gypsum, Concrete, and Clay Products	4	11	11	7	5	4	104	42
D. Paints, Petroleum Products, Paper, Textiles, Rubber, Soap, etc.	21	34	42	16	31	4	281	176
E. Miscellaneous Subjects, Testing, etc.	..	..	2	2	..	1	11	21
Total	39	74	75	31	67	19	581	353


Blank & Stoller
R. C. Griffin


Harris & Ewing
Jerome Strauss


O'Connor Studio
C. H. Fellows


Harris & Ewing
Stanton Walker


Blank & Stoller
P. D. Merica

NEW OFFICERS

The recent election of officers, as announced at the annual meeting by the tellers, resulted in the unanimous election of William M. Barr as President (1940–1941), Herbert J. Ball as Vice-President (1940–1942), and the following as members of the Executive Committee (1940–1942): C. H. Fellows, Roger C. Griffin, Paul D. Merica, Jerome Strauss, and Stanton Walker.

President

William M. Barr, the new President, Chief Chemical and Metallurgical Engineer, Union Pacific Railroad Co., Omaha, Nebr., is a native Iowan, who was graduated from the University of Iowa, 1902, B.Sc.; Grinnell College, 1904, M.A.; and University of Pennsylvania, 1908, Ph.D. He was elected to Sigma Xi in 1902. Following his university work he was Chemist with the Mallinckrodt Chemical Works; Professor of Engineering Chemistry, Iowa State College; then Manufacturing Research Chemist with the Mallinckrodt Chemical Works, and later became Manager of the Eastern Works of this company. In 1916 he entered the employ of the Union Pacific Railroad Co. as Consulting Chemist, became Assistant to the Executive Vice-President, and later Chief Chemical and Metallurgical Engineer, in which position he has charge of laboratories, water supply, inspection and tests of materials, and specifications for materials. Among his important works have been the improvement and handling of water supplies for locomotives and the development of alloy-steel forgings for railway service.

Doctor Barr has written papers on water treatment, engine failures, and materials, use of alloy steels in locomotives, etc. He has been active in the work of the A.S.T.M. Committee A-1 on Steel for many years, served as Vice-Chairman of the Main Committee, and Chairman of Subcommittee VI on Steel Forgings and Billets since 1936. He is also a member of the committees on wrought iron, and paint, varnish, lacquer, and related products. Doctor Barr was a member of the Executive Committee, 1934 to 1936, and Vice-President, 1938 to 1940. His other Society affiliations include the American Chemical Society, American Institute of Chemical Engineers, American Railway Engineering Association, and Engineers' Club of Omaha (Past-President).

Vice-President

Herbert J. Ball, the new Vice-President, Head, Dept. of Textile Engineering, Lowell Textile Institute, Lowell, Mass., received his B.S. degree in Mechanical Engineering from the Massachusetts Institute of Technology in 1906. Later he completed a course in Professional Accountancy and received the degree of B.C.S. in 1916 from Northeastern University. A member of the faculty at Lowell from 1906 to 1918, he was made Head of the Textile Engineering Dept. in the latter year. As an active member and Chairman since 1930 of one of the Society's largest and most active committees, Committee D-13 on Textile Materials, he has contributed notably to the advancement of standardization and research work in this field. During the years that he has been chairman, some of the committee's outstanding accomplishments have been made.

He was a member of the Society's Executive Committee in 1934 to 1936 and again from 1939 to 1940. He also renders service as a member of Committee E-6 on Papers and Publications. In addition to the A.S.T.M., he holds membership in The American Society of Mechanical Engineers, U. S. Institute for Textile Research, and the British Textile Institute.

Members of Executive Committee

C. H. Fellows, Head, Chemical Division, Research Dept., The Detroit Edison Co., Detroit, Mich., a graduate of Purdue University, where he received the degree of B.S. in Chemical Engineering in 1918, has been connected with The Detroit Edison Co. since 1919. Mr. Fellows has participated in a number of phases of work of A.S.T.M. and other groups. Since 1935, he has been chairman of the Joint Research Committee on Boiler Feedwater Studies, sponsored by six organizations. He has been a member of Committee D-2 on Petroleum Products and Lubricants for many years and served on Committee D-9 on Electrical Insulating Materials. He is active in the work of Committee D-19 on Water for Industrial Uses, is a member of Committee A-5 on Corrosion of Iron and Steel, and has served the Society as secretary of the Detroit District Committee since 1935, recently being elected vice-chairman. He is a member of the Prime Movers Committee of the Edison Electric Institute, and The American Society of Mechanical Engineers' Special Research Committee on Critical Pressure Steam Boilers. For ten years he has been chairman of the Power Station Chemistry Subcommittee of the Prime Movers Commmittee of the Edison Electric Institute. He is the author of a number of papers and reports on subjects involving power station chemistry including feedwater treatment, corrosion, and reactions between high-temperature steam and metals used in modern boilers and superheaters.

Roger C. Griffin, Treasurer, Arthur D. Little, Inc., Cambridge, Mass., after his graduation from Harvard, 1904, with an A.B. degree, Magna Cum Laude in Chemistry, and two years in the graduate school, from which he received the degrees of A.M. and S.M. in 1906 and 1905, was Chemist at the Mallinckrodt Chemical Works, St. Louis, Mo. In January, 1909, he entered the employ of Arthur D. Little, Inc., with which organization he has been connected continuously. A leading industrial research organization, the firm was founded by Mr. Little and Roger B. Griffin, Mr. Griffin's father. In 1918, he became Director of Tests, was Assistant Treasurer, and a member of the Board of Directors for many years, and has been Treasurer since 1935. Mr. Griffin has been active in the work of the Society, particularly as chairman of Committee D-6 on Paper and Paper Products, of which he has been chairman since 1937. He is a member of the American Chemical Society, has been particularly active in the work of the Technical Association of the Pulp and Paper Industry as chairman of its Testing Division for a number of years, has been chairman of its Standards Committee since 1933, and a member of its Executive Committee since 1936. He is the author of a large number of technical articles and was the editor of the book, "Technical Methods of Analysis."

Paul D. Merica, Vice-President and Director, The International Nickel Co., Inc., 67 Wall St., New York, N. Y., after receiving his technical education at Depauw University and the University of Wisconsin (A.B. degree in 1908), became Professor of Chemistry in Chekiang Provincial College, Hangchow, China. Then he studied at the University of Berlin, receiving the degree of Doctor of Philosophy in 1914. For the next five years he was a member of the staff, Division of Metallurgy, National Bureau of Standards, during which time with Waltenberg and Scott he did important work in developing the theory of dispersion hardening or precipitation hardening in metals. Since 1919, he has been with the International Nickel Co., becoming Assistant to the President. Election to the Board of Directors in 1935 was followed by appointment to his present position. A member of the A.S.T.M. for many years, he was from 1920 to 1930 Secretary of Committee B-2 on Non-Ferrous Metals and Alloys. He also served on Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys. He previously served as a member of the Executive Committee from 1928 to 1930. Awarded the honorary degree of Doctor of Science by Depauw in 1934, he was also recipient of the A.I.M.E. James Douglas Medal for distinguished service in non-ferrous metallurgy. He is a former Vice-President and Director of the Institute and has been active in the work of the American Society for Metals. In 1938, he received the John Fritz Medal awarded by the four founder societies for notable scientific or industrial achievement, the award being made to Doctor Merica for important contributions to the development of alloys for industrial uses.

Jerome Strauss, Vice-President, Vanadium Corp. of America, New York, N. Y., following a period of study at the City College of New York, entered Stevens Institute of Technology, receiving his M.E. degree in 1913. He was class valedictorian, was awarded the Priestley prize in chemistry and the Stillman prize in applied technology. After service in the Metallurgical Department of the Illinois Steel Co., he entered the employ of the Western Drop Forge Co. and served as Chief Chemist and Metallurgist until 1923, with the exception of two years, 1917–1919, when he was an officer in the Ordnance Department, U. S. Army. He then became Materials Engineer, U. S. Naval Gun Factory, Washington, D. C., and from 1928 to 1935 was Chief Research Engineer, Vanadium Corp. of America, with headquarters at Bridgeville, Pa. He has been Vice-President since 1935. Mr. Strauss has been very active in many phases of Society work, particularly in the field of ferrous and non-ferrous metals. He has been chairman of Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys since it was organized in 1929 and serves on several other standing committees. He represents the Society on the Iron Alloys Research Committee of the Engineering Foundation and this year, on nomination of the Society, was elected a member of the Board of Directors of the American Standards Association. He is the author of numerous papers, reports, and articles in the metallurgical field. He is a member of a number of other societies, including: American Institute of Mining and Metallurgical Engineers, American Society for Metals, American Petroleum Institute, American Welding Society, British Institute of Metals, and British Iron and Steel Institute.

Stanton Walker, Director, Engineering and Research Division, National Sand and Gravel Assn., Washington, D. C., received his technical education at the University of Illinois from which he was graduated in 1917. He was Research Engineer, Portland Cement Assn., until 1926. For many years, he has been Director of the Engineering and Research Divisions of the National Sand and Gravel Assn., the National Industrial Sand Assn., and the National Ready-Mixed Concrete Assn. An outstanding authority in his field, he has prepared a large number of papers and reports published in the technical press and society journals. A very active member of the Society, he has been concerned with the work of a number of A.S.T.M. committees including C-9 on Concrete and Concrete Aggregates, D-4 on Road and Paving Materials, C-12 on Mortars for Unit Masonry, and C-7 on Lime. He has rendered particularly valuable service as a member of the Committee on Papers and Publications. His other society affiliations include: American Society of Civil Engineers, American Concrete Institute, American Institute of Mining and Metallurgical Engineers, American Foundrymen's Association, American Railway Engineering Association, Washington Society of Engineers, in several of which he is active in committee and related work. Mr. Walker is a member of the Board of Direction of the American Concrete Institute. Recently, a fellowship established by the National Sand and Gravel Association at the University of Maryland was named in his honor.

Recognition of Forty-Year Members

Four Individuals and Four Companies Continuously Affiliated Since 1900

An interesting feature of recent annual meetings has been the recognition of individuals and organizations who have been affiliated with the Society as members for a period of 40 years. At the 1938 meeting nine individuals and four organizations were recognized. The next year, 1939, there were three personal members and two organizations, and at the Forty-third Annual Meeting four personal members and four companies received certificates signifying that they had been members of the Society continuously since 1900.

Past-President A. C. Fieldner presiding at the formal opening session of the meeting called upon the individual members and then the representatives of company memberships to come forward to receive the certificates from President Morgan. A list of those who received certificates follows:

F. H. Clark, Consulting Engineer, New York City.
T. L. Condron, Member of Firm, Condron & Post, Chicago, Ill.
Robert Job, Vice-President, Milton Hersey Co., Ltd., Montreal, Canada.
Charles B. Wing, Consulting Civil Engineer, and Professor of Structural Engineering, Emeritus, Stanford University, Palo Alto, Calif.
American Steel and Wire Co., F. C. Elder, Chief Metallurgist.
Colorado Fuel and Iron Co., J. H. Reece, Chief Inspector.
National Tube Co., E. C. Wright, Chief Metallurgist.
John A. Roebling's Sons Co., Alfred Bellis, Chief Electrical Engineer.

Messrs. Condron and Wing were unable to be present at the meeting and Mr. Wright who was called away on business was represented by H. R. Redington. With these latest additions, the total number of forty-year members who have been recognized is 26.

Discussion of Annual Meeting Papers

Written discussion of the papers and reports presented at the 1940 Annual Meeting in Atlantic City will be received by the Committee on Papers and Publications until September 3. However, all who plan to submit discussion are urged to send it to Society Headquarters as far in advance of this date as possible in order to facilitate preparation of material for the *Proceedings*. Discussion adds considerably to the value of the technical material published in the *Proceedings* and all those who may have additional material to submit, or wish to offer constructive comments, are urged to do so.

Record-Breaking Annual Meeting

(*Continued from page 8*)

of Materials, Missouri State Highway Dept., for their paper on "Thermal Volume Change and Elasticity of Aggregates and Their Effect on Concrete" presented before the Society at its 1939 Annual Meeting in Atlantic City.

Mr. E. E. Thum, Editor, *Metal Progress*, who was chairman of the Dudley Medal Committee consisting of R. R. Litehiser, Chief Engineer, Bureau of Tests, Ohio State Highway Testing Laboratory, Ohio State University, and F. P. Partridge, Director of Research, Hall Laboratories, Inc., in presenting the recipients to Mr. Morgan to receive the Dudley medal outlined the procedure used by the committee in selecting the winning papers. After grading a number of those studied the committee reviewed papers of previous years which have won for the authors the Dudley medal and found that their grading system seemed sound. After considering all of the contributions made at the 1939 Annual Meeting, the paper by Messrs. Willis and De Reus won the award because it was an original research on the properties of concrete aggregate; second, it developed some entirely new information on that subject which is of course an important material of construction; in the third place, it used ingenious and simple testing equipment and should stimulate further work in this field.

Ceremonies in connection with the first Sanford E. Thompson award made at the Eighteenth Session were extremely interesting in that Mr. Thompson, first Chairman of Committee C-9 after whom the award was named, was present and made the awards to Messrs. Willis and De Reus. Mr. Thompson pointed out that the subject of the winning paper was directly in line with the original aims of Committee C-9: namely, the attainment of durable concrete. He discussed briefly and appropriately various points in connection with the early work of the committee, outlined some of the committee's research, and stressed the important progress made in its standardization work, particularly the development of testing procedures. He pointed out that the authors studied the effect of different constituents, both volume changes and elasticity with special reference to durability in weathering and had incorporated basic factors considered by Committee C-9 to be essential in a paper to win the award, namely, originality of approach, skill in execution, and stimulation to further work in an important field of concrete research.

A native of Kansas City, Mo., Mr. Willis was graduated from the University of Missouri in 1922. After a year of postgraduate work in chemistry and physics, he was employed by the Missouri State Highway Dept., serving first as Chemist, subsequently as Laboratory Director, and since 1928 as Chief, Research Division, Bureau of Materials.

Mr. De Reus received his high school training at Oskaloosa, Iowa, where he received the Medal of the National Honor Society. In 1929 he received his B.S. degree in Engineering from Iowa State College. Since 1930 he has been associated with the Research Dept., Bureau of Materials, Missouri State Highway Dept.

Outstanding Reports

While the number of actions recommended in the report of a standing committee may not necessarily indicate it as outstanding, it does indicate activity. In this regard there were certain of the committees which submitted notable reports, including A-1 on Steel, B-5 on Copper and Copper Alloys, C-8 on Refractories, D-1 on Paint, Varnish, Lacquer, and Related Products, D-2 on Petroleum Products and Lubricants, D-6 on Paper and Paper Products, D-11 on Rubber Products, D-12 on Soaps and Other Detergents, D-20 on Plastics, and in particular, D-13 on Textile Materials.

Committees B-5 and D-13 were closely parallel from the standpoint of numbers, recommending, respectively, ten and nine new tentative standards, with numerous revisions of others, in each case. Three of the D-13 recommendations are of widespread interest, giving standardized requirements for wool and cotton blanketing and tests for resistance of fabrics to water and to moths. Four of the new tentative standards pertain to glass yarn, tapes, fabrics, and sleeving. Some of the B-5 recommendations were of particular significance in view of their relation to the national preparedness program, involving requirements for brass cartridge case cups, gilding metal sheet and strip, and gilding metal bullet jacket cups. Others covered copper rods and bars, brass wire, and miscellaneous brass tubes.

The recommendations of the Steel Committee included four new specifications for carbon- and alloy-steel forgings for industrial use and for railroads, and requirements for welding fittings. Certain of the new tentative standards recommended by Committee C-8 on Refractories involved reclassification and segregation of certain materials cover-

R. L. Templin, M. F. Sayre, and F. B. Seely.

J. D. Tyson and R. W. Steigerwalt.

H. V. Churchill, T. A. Wright, and C. C. Nitchie.

ing refractories for heavy and moderate duty stationary boiler service and refractories for malleable iron furnaces and annealing ovens, an important new classification of insulating fire brick and a test for warpage of refractory brick and tile.

Recommendations in the field of paint, varnish, etc., involve three new specifications for pigments—titanated lithopone, ultramarine blue, and carbon black. Testing procedures were approved covering consistency of enamel type paints and methods of evaluating liquid driers.

The Committee on Paper and Paper Products (D-6) as a result of intensive study of methods based upon standards of the Technical Association of the Pulp and Paper Industry proposed seven new methods covering determination of casein, cellulose, starch, paraffin content, ash content, opacity, and procedures for sampling. In addition to new specification requirements for olive oil solid soap, salt-water soap, tetrasodium pyrophosphate, and sodium sesquisilicate, Committee D-12 on Soaps and Other Detergents had in its report, as information only, two other proposed specifications covering detergent soap powder and grit cake soap.

Some of the recommendations of Committee D-11 on Rubber Products are of particular interest to the automotive industry, some of the new tentative standards having been developed by Technical Committee A on Automotive Rubber which is sponsored jointly with the Society of Automotive Engineers. New test methods have been approved covering hydraulic brake hose, test for compression-deflection characteristics of vulcanized rubber, test for accelerated aging of vulcanized rubber, and requirements for ozone-resistant insulation.

Committee D-2 on Petroleum Products and Lubricants, in addition to new standards covering tests for carbonizable substances in white mineral oil, test for dropping point of lubricating grease, and method of calculating viscosity index, also had published in its report as information a test for aniline point of petroleum products, a test for ignition quality of Diesel fuels, and a Diesel-fuel-oil classification, the latter two items having been previously published, but because of changes are again published, on the recommendation of the committee so that the latest information will be available for comment.

Three important new tentative standards are to be published resulting from the work of Committee D-20 on Plastics, including test for flammability of plastics, measuring flow temperatures of thermoplastic molding materials, and test for water absorption of plastics.

Of the four recommendations of Committee D-18 on Soils for Engineering Purposes, three were approved covering moisture-density relations of soil-cement mixtures, wetting-and-drying test, and freezing-and-thawing test of soil-cement mixtures.

The report of Committee C-1 on Cement was notable because of the recommendation of new specifications for portland cement covering five types of cement and the new test for autoclave expansion of portland cement, and also for a number of subcommittee reports, one on volume change and soundness and another on plastic mortar tests.

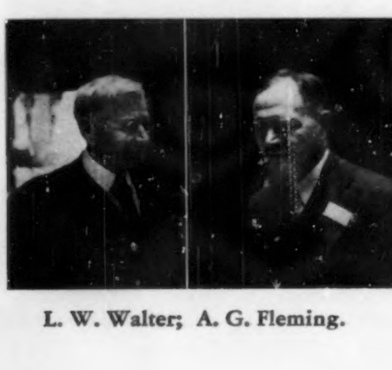
An extensive report was forthcoming from Committee A-5 on Corrosion of Iron and Steel with a new test for uniformity of coating by the Preece test on zinc-coated iron or steel articles which combines certain other methods and extends the field. Of interest also was the report of the committee on tests of galvanized sheets and particularly the final report of the work on total immersion tests of sheets, certain conclusions being of particular interest—one, that the addition of copper increased the life of all the materials, except high-phosphorus steel, under test at both locations, and that the open-hearth iron lasted longer than the basic open-hearth steel in both the high- and low-copper groups.

Changes in Reports

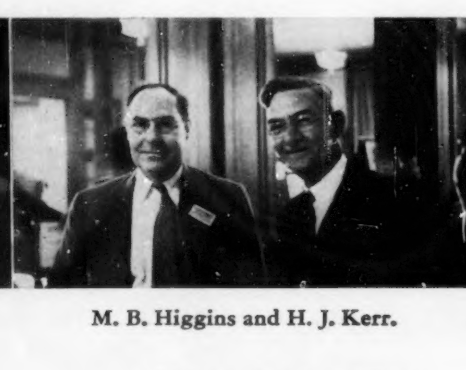
A number of the committees reporting at the annual meeting modified their preprinted reports and in several cases recommended additional actions not covered in the reports. In some instances the annual meeting sessions referred matters back to the groups for further study. Among the committees involved in changes are the following:

A-1 on Steel
B-1 on Copper and Copper-Alloy Wires for Electrical Conductors
B-4 on Electrical-Heating, Electrical-Resistance, and Electric-Furnace Alloys
B-5 on Copper and Copper Alloys, Cast and Wrought
D-2 on Petroleum Products and Lubricants
D-5 on Coal and Coke
D-18 on Soils for Engineering Purposes

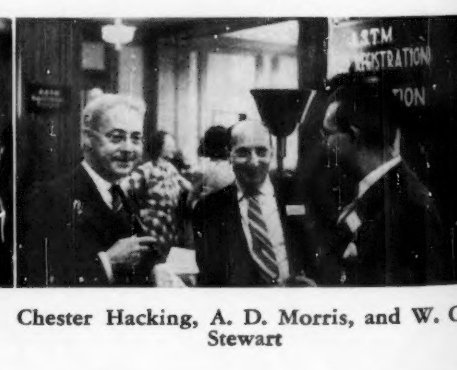
The steel committee withdrew its recommendations to adopt certain revisions in the specifications for electric-fusion-welded steel pipe for high-temperature and high-pressure service (A 155 – 36) and in the specifications for forged or rolled steel pipe flanges for general service (A 181 – 37), with the recommendation that these revisions first be published as tentative. It also took action to recommend the adoption as standard of five boiler and superheater tube specifications; this recommendation does not appear in the report. In three of the still tube specifi-



L. W. Walter; A. G. Fleming.



M. B. Higgins and H. J. Kerr.



Chester Hacking, A. D. Morris, and W. C. Stewart

cations new requirements on tolerances and finishing of the material for header tubes were recommended. A number of additional recommendations were approved in various specifications for materials for use at high temperatures. Full details of these are given in the *Summary of Proceedings*.

Proposed new specifications for bare rope-lay-stranded and bunch-stranded soft copper cables for electrical conductors recommended by Committee B-1 were referred back to the subcommittee in charge for further study. Also proposed revisions in the twist test of the specifications for hot-rolled copper rods for electrical purposes (B 49 – 39) were not accepted and will be studied further and possibly published as information and comment before action is taken.

While all of the recommendations of Committee B-5 received favorable vote in the Society's session, a number of changes and additional material were incorporated, some of an editorial nature, others clarifying existing material. The *Summary of Proceedings* lists all changes of a substance nature.

Based on consideration given by the Society's Executive Committee in connection with the proposed definition for coke, Committee D-5 withdrew this material from its report.

While Committee D-18 on Soils carried through to the annual meeting its recommendation to have published as tentative the method of test for water absorption and resistance to plastic flow of mixtures of soil and emulsified asphalt, this was not approved at the meeting but was referred to Committee E-10 on Standards for consideration.

Committee B-7 had a number of additional revisions in certain of its specifications in the field of aluminum and magnesium. The committee on petroleum products and lubricants also submitted additional changes in certain of the standards in its charge.

Proposed revisions by Committee B-4 involving the Method for Bend Testing of Wire (B 113) were not approved by the annual meeting session and will be studied further.

INTERESTING GOLF TOURNAMENT; LADIES' ENTERTAINMENT

What was undoubtedly one of the most interesting golf tournaments of the long series was featured at the annual meeting. The plan of having play on four days and awarding daily prizes, as developed by the Golf Committee headed by M. Rea Paul, National Lead Co., resulted in 42 rounds being played. Paul Anderson, Kentucky State Highway Commission, for his low gross of 76, won possession for one year of the A.S.T.M. Golf Cup. C. M. Loeb, Climax Molybdenum Co., who won permanent possession of the previous cup declined to compete this year, although his scores for two rounds, 71 and 72, still rank him as the "champeen." Low gross on two other days was won by V. A. Crosby, Climax Molybdenum Co., and E. W. McMullen, The Eagle-Picher Lead Co.

Winners of the kicker's handicap were: M. A. Swayze, Lone Star Cement Corp.; V. A. Crosby; D. W. Mulford, William Zinsser and Co., Inc.; R. L. Clingerman, The William Bayley Co. (tied with B. H. Wait and won on draw); E. W. McMullen; and R. Baker.

Winners of the low gross on three blind holes were: W. B. Price, Scovill Manufacturing Co. (tied with Paul Anderson and won on draw); R. F. Passano, The American Rolling Mill Co.; and C. M. Loeb (twice).

Winners of the prizes for ball nearest the pin were: J. E. Boyd, Weston & Brooker Co.; R. V. Reece, American Bemberg Corp.; and J. McE. Sanderson, American Cyanamid and Chemical Corp.

The Golf Committee had selected a number of appropriate prizes which were awarded to the various men. An analysis of the scores indicates there were four in the 70's (Mr. R. V. Reece had a 78); thirteen in the 80's, beginning with Mr. H. G. Farmer's (Universal Atlas Cement Co.) 81; eleven rounds were between 90 and 95; six ranged from 96 to 99; and eight were 100 or over.

All who were interested in the tournament agreed that the new plan developed by the Golf Committee, the members of which cooperated wholeheartedly in putting it in effect, added a good deal to the interest in the event.

Many of the 295 ladies who registered at the meeting participated in the entertainment features arranged by a Ladies' Committee headed by Mrs. J. K. Rittenhouse. The highlight of the week was the Bridge Tea on Wednesday; other features included a boat trip and readings by a palmist in connection with an afternoon tea. Steel pier and rolling chair tickets were furnished each lady.

What Happened to Standards at the Annual Meeting—Where They Will Be Found

WHILE IT is stated in the article in this BULLETIN on the annual meeting, and again in a short article referring to the number of actions submitted to letter ballot, that the "Summary of Proceedings," being sent to each member in a separate mailing concurrently with this BULLETIN, provides a concise listing of all standardization actions taken at the annual meeting, it is noted again that members wishing to know exactly what action was taken at the meeting on the various committee recommendations can get this information from the "Summary." If a new tentative standard was approved, it is so indicated; if changes were made in it at the meeting, these are given. Any changes and recommendations in the report are here noted. The "Summary of Proceedings" is the official notice to members of changes in the reports and provides essential information in marking the Society letter ballot on adoption of proposed standards and revisions of existing standards.

As indicated elsewhere in this BULLETIN, the 1940 Supplements to the Book of Standards will be ready about November 15. There will be a separate Supplement for each of the three Parts of the Book of Standards, the Supplements being bound in cloth. All new tentative standards and revised tentative standards will appear in the respective Supplements; they will give the formal standards which were adopted as of Sept. 3, and also all the formal standards in which revisions were adopted. Tentative revisions of standards published for a year or more before final adoption will be included in the Supplements. In short, the Supplements will bring completely up to date the existing Book of Standards, containing all items acted upon at the annual meeting.

Interesting Prints in Photographic Exhibit

Committee on Radiography also Has Display

THE THIRD Photographic Exhibit at Atlantic City included some 110 prints submitted by members of the Society and those connected with company members, with a large number of the photographs of very distinct interest to those attending the annual meeting.

The exhibit was arranged by a special committee from the Philadelphia area under the chairmanship of J. P. Mudd of the Midvale Co. The prints covered various phases of testing and research in materials with a very considerable percentage consisting of unusual pictures of apparatus and also illustrations of unique applications of materials. The prints were classified according to amature and professional and judging was carried out on the basis of 70 per cent for portrayal value and 30 per cent for timely interest and importance of subject matter.

The prize winners are as follows:

AMATEUR

First Prize: *Transparent Plastic Mounting Metallographic Specimen*, A. G. Dean, E. G. Budd Mfg. Co.

Second Prize: *Close-up of Flash Only in Flashover Test at 50 Kilovolts of a 15 Kilovolt Dilecto Oil Switch Bushing*, N. W. Sieber, Continental Diamond Fibre Co.

Third Prize: *Creep Measurement*, John B. Flad, Crane Co.

Honorable Mention: *Only the Ultimate*, J. I. Berschens, State Highway Commission of Wisconsin.

Honorable Mention (*continued*):

The Birth of a Myriad Sun Glasses, E. L. Hettinger, Willson Products, Inc.

Quest for Oil, H. M. Frecker, Jr., U. S. Rubber Co.

"Unpierced—16-ft. Drop." An A.S.A. Test on Safety Glass, Floyd Borgstedt, Patzig Testing Labs.

Bend Test for Thin High Tensile Metal, A. G. Dean, E. G. Budd Mfg. Co.

PROFESSIONAL

Honorable Mention: *A.S.T.M. Designation D 90-?*, H. R. Luck, Shell Development Co.

Tensile Strength, F. G. Tropea, E. I. du Pont de Nemours and Co., Inc.

Cutting Through a 6-in. Steel Plate with an Oxyacetylene Torch, K. A. Kjeldsen, Western Electric Co.

A Portable Standard for Calibration Proving Ring, Enclosed Electrical Vibrating Reed and Vernier Micrometer Dial, E. F. Brown, Tinius Olsen Testing Machine Co.

Demonstrating the Extinguishing Effect of Air-Foam on a Gasoline Fire, Carlton R. Nelson, Associated Factory Mutual Fire Insurance Cos.

It is planned that some of the prize-winning prints will be used as illustrations in the ASTM BULLETIN from time to time and it is hoped that there will be opportunities to use some of the prints submitted by the Photographic Committee, a number of which were excellent. These were not entered in the competition and consequently were not judged.

There were also displayed by means of an automatic projection machine a number of colored transparencies. Under the auspices of Committee E-7 on Radiographic Testing with Dr. Victor Hicks, Physicist, Westinghouse X-ray Co., in charge, an interesting radiographic display was held throughout the meeting. A number of members of the committee cooperated in the exhibit and illuminators were lent through the courtesy of Doctor Hicks' company. There were a number of very interesting illustrations, various radiographic standards, and also penetrameters. This attractive display created much interest and with the photographic exhibit met with many favorable comments on the part of the members.

"Transparent Plastic Mounting Metallographic Specimen"

First prize winning photograph in the Third A.S.T.M. Photographic Exhibit, by A. G. Dean, E. G. Budd Mfg. Co.

Halftone Courtesy *Buddgette*

Three Honorary Memberships Awarded

Messrs. Cloyd M. Chapman, H. E. Smith, and Thomas R. Lawson

THREE LONG-TIME members of the Society, each an outstanding technologist in the engineering field and each having contributed to the advancement of the Society's work and welfare, were awarded Honorary Memberships at the Forty-third Annual Meeting, by unanimous election of the Executive Committee. The awards were made by President Morgan, to the three men —Cloyd M. Chapman, H. E. Smith, and Thomas R. Lawson, after the citations were reported as indicated below.

Cloyd M. Chapman

Mr. Chapman was conducted to the President by Past-President K. G. Mackenzie, a long-time friend of Mr. Chapman. He mentioned some of Mr. Chapman's outstanding work and activities as given in the biographical sketch below and commented on Mr. Chapman's development of a system of medical X-ray photography by which large numbers of individuals can be examined in a day at a very moderate cost. He also commented on the large number of technical articles prepared by Mr. Chapman.

In responding, Mr. Chapman, who is well known to large numbers of the Society's membership as are the two other honorary members whose sketches follow, spoke with much feeling on his long contacts with the Society. In part he said . . . .

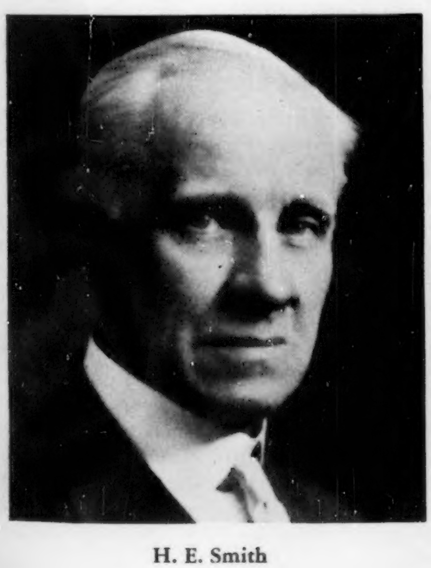
"For thirty-odd years, about a third of a century, I have had the high privilege and pleasure of being more or less intimately associated with as fine a group of technical men in many branches of engineering as can be found in the world, and usually on friendly terms! This means that I have been brought into contact with men whom I might not otherwise have met, or if I did meet them, it would be in the course of business and the contact would have ended with the business. It means that I have formed some of the finest friendships that I possess, without which it would be a dreary world indeed. Those friendships are lasting. It means that for more than thirty years I have enjoyed the rewards of that association and of doing interesting work. Some of it, I hope, was worth while. But I met and came to know many of the best minds and the finest men in this organization. It means that I have had the great privilege of rubbing up against some of the brightest and greatest men in materials engineering and research in this country and a few from abroad. Those contacts rubbed off some of the barnacles from my rough outside. There are plenty of them left; the job is not finished. I hope to keep on rubbing up against these personalities until I am rubbed out. That is the true confession of my association with the American Society for Testing Materials. For that I receive the highest reward in the power of the Society to bestow, a sort of bonus over and above the pay I have been receiving all of these years. I received my pay check at every committee meeting, and every subcommittee meeting, every Executive Committee meeting and every Society meeting I attended. I might liken myself to the president of a prosperous business concern, if there are any such, who, although greatly overpaid in salary, is given a huge bonus in addition and then retires. Remember what I have said, especially you younger members. When the time comes, as it will to some of you, when you can look back upon the many years of active association with this organization and with the men you will come to love and admire and respect, you will say, as I say: I am the debtor; I received more than I gave. This certificate will remind me of my obligation. I accept it gratefully on those terms."

Biographical Sketch:

Mr. Chapman prepared for Cornell University at Buchtel College in Akron, Ohio. He took the mechanical engineering course at Cornell University, Class of '98, and interrupted his course to enter the Navy as Engineer Officer (Ensign) during the Spanish-American War. Later he entered the employ of Thomas A. Edison, serving as assistant in his laboratory at West Orange, and also in mining exploration and development in Canada, New Mexico, and Australia.

In 1905 he entered the employ of Westinghouse, Church, Kerr and Co., as construction engineer, and later as engineer in charge and engineer of tests in charge of laboratory examination of materials of construction. He specialized in power plant and manufacturing plant design and construction, and in design of special machines. He has been in consulting engineering practice since 1920.

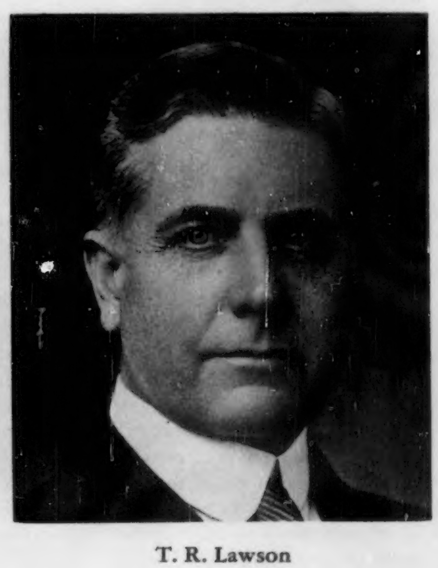
Mr. Chapman has been affiliated with the Society since 1908. He has been a most active member serving on a large number of committees and taking part in other phases of important Society work. The committees on which he has had long periods of service include A-5 on Corrosion of Iron and Steel (1914 to 1937); D-1 on Paint, Varnish, Lacquer, and Related Products; C-7 on Lime; C-9 on Concrete and Concrete Aggregates (vice-chairman for several years; chairman, 1926 to 1932); C-1 on Cement,



H. E. Smith

Halftones Courtesy *Engineering News-Record*

Cloyd M. Chapman



T. R. Lawson

since 1916; the former Committee D-15 on Laboratory Glassware, and several others. He has been chairman of Committee E-8 on Nomenclature and Definitions since 1922. One of his important contributions to A.S.T.M. work has been in connection with the works of Committee E-10 on Standards of which he was a member for ten years and chairman for two periods aggregating five years.

A member of the Executive Committee, 1926 to 1928, he was Vice-President from 1930 to 1932 and served as President, 1932 to 1933.

Despite his intense activity in so many phases of A.S.T.M. work, he has also been active in the work of other organizations. He is a member of The American Society of Mechanical Engineers and represented the A.S.M.E. on the Council of the American Standards Association of which association he was also a Vice-President and Director. He is a former Director of the American Concrete Institute and a member of the Edison Pioneers.

The wide extent of his interests are indicated by the range of subjects covered in his technical papers and reports—paint tests, structural steel coatings, corrosion testing, wood preservatives, concrete aggregate specifications and their testing, paint thinners, shrinkage of mortar, etc.

H. E. Smith

In presenting Mr. Smith, Past-President H. F. Moore expressed his pleasure and honor in doing so. He commented on some of Mr. Smith's activities as outlined below, particularly his service on so many standing committees of the Society and stated that "Mr. Smith belonged to that group which we cannot exactly define but we all recognize as members of the Society who, as the years go on, become the well-beloved members, members that we turn to not merely for our technical help, but for sympathy—members that we like. Such, I think, has been Mr. Smith to all who have come to know him."

It might have been said that probably in the thoughts of everyone present, at least the large number who knew him, that no one more richly merited this highest honor which the Society can bestow. Mr. Smith's characteristic vigor was recognized at the meeting in another way when he was unanimously chosen to act as Chairman of Committee D-1 on Paint, Varnish, Lacquer, and Related Products for another term of two years.

Mr. Smith in his response said that membership in A.S.T.M. was all that Mr. Chapman had mentioned in the way of association but that it brought to him two outstanding privileges in addition: ". . . . one has been the inspiration that it has given me not only in the work of the Society, but in my own principal vocation in life—that has been without measure. The second thing is that it has been highly educational, a sort of postgraduate course that cannot be overestimated. For all of these opportunities I feel very grateful to the Society."

Biographical Sketch:

Mr. Smith joined the Society in the year of its incorporation, 1902. After graduating from Massachusetts Institute of Technology in chemistry, he was employed by the Chicago, Milwaukee, and St. Paul Railroad, subsequently becoming Chief Chemist. In 1902 he became associated with the Lake Shore and Michigan Southern Railway as Chemist and Engineer of Tests and organized their testing department. When this company was consolidated into the N.Y.C.R.R. he became Engineer of Tests of the latter in 1916. Granted a leave of absence from 1918 to 1920, he served on the general staff of the U. S. Railroad Administration in charge of the inspection of materials for new equipment purchased. When the testing department of the N.Y.C.R.R. was expanded to the N.Y.C. Lines' organization, he was made Engineer of Tests. From 1926 to 1932 he was engineer of materials in charge of specifications and special investigations and since then has devoted himself to consulting practice.

Like a number of other long-time members of the Society in the railroad field he has been an active and valuable committee worker. From 1910 to 1933 he served on Committee B-2 on Non-Ferrous Metals and Alloys; was a member of Committees A-1 on Steel and A-2 on Wrought Iron for over twenty years, chairman of the latter from 1917 to 1924. Except for a brief period his affiliation with Committee A-5 on Corrosion of Iron and Steel has been continuous from 1914. As engineer of tests in connection with the recently inaugurated and extensive outdoor tests of wire and wire products, under the auspices of Committee A-5, Mr. Smith rendered extremely valuable and efficient service to the Society.

Another example of continuous service is represented by his connections with Committee D-1 on Paint, Varnish, Lacquer, and Related Products, dating from 1911. Active in numerous phases of its subcommittees' work, he was elected to the chairmanship of the Main Committee in 1938 and he has just been reelected for the next two years. Other A.S.T.M. committees of which he has been a member include D-2 on Petroleum Products and Lubricants, Committee E-9 on Research, and the former Joint Committee on Phosphorus and Sulfur in Steel. His current committee connections also include D-19 on Water for Industrial Uses. Mr. Smith was a member of the Society's Executive Committee from 1929 to 1931.

During his active career in the materials field he has been affiliated with a number of other organizations, particularly in the railroad field.

T. R. Lawson

Prof. Thomas R. Lawson, who was unable to be present at the meeting because of ill health, was presented *in absentia* by Past-President T. G. Delbridge. He outlined Professor Lawson's extensive work in the Society as given below and commented on some of his other activities. President Morgan, in presenting the certificate, extended the regards of the Society and its wishes for an early and complete recovery.

Biographical Sketch:

Professor Lawson received his elementary education in the Wheeling Public Schools and was graduated from Rensselaer Polytechnic Institute with the degree of C.E. in 1898. Since that time until his retirement in 1939 he has been a member of the R.P.I. faculty, was Professor of Rational and Technical Mechanics since 1909, and Head of the Department of Civil Engineering since 1921. In addition to his teaching work, he has had a wide consulting practice involving questions of strength of materials, hydraulics, mechanics, and structures. He was consulting engineer for a number of municipalities and various bridge companies. He conducted many researches in engineering materials, including concrete, electric welding, fatigue phenomena, and brick.

He has been a member of the Society since 1907, was a member of the Executive Committee 1928 to 1930; Vice-President, 1932 to 1933; and President, 1933 to 1934. He has been very active on a number of committees including former Committee C-3 on Brick on which he held membership from 1911 and was chairman from 1922 to 1930. He continued his work on Committee C-15 on Manufactured Masonry Units, and is chairman of Subcommittee VI on Sewer Brick. He has served on Committee E-10 on Standards, chairman 1929 to 1933, and is a member of Committee E-1 on Methods of Testing. In 1939 he was chosen honorary chairman of Committee C-15 in recognition of his contributions to the work in this field. He was one of the active participants in the work of the Research Committee on Yield Point of Structural Steel.

He has been active in the work of a number of other groups including the Permanent Committee on Simplification of Varieties and Sizes of Vitrified Paving Brick, Committee on Fundamental Research in Welding of the American Welding Society, and the Fatigue Committee of the National Research Council. He has prepared a number of articles and publications. Professor Lawson has held memberships in a number of societies including the American Society of Civil Engineers, American Welding Society, American Concrete Institute, American Association for the Advancement of Science, and is a Past-President of the Clay Products Institute of America and the Society of Engineers of Eastern New York. His honor societies are Sigma Xi and Tau Beta Pi.

Materials Standards in National Preparedness[1]

By Lieut. Col. William C. Young[2]

THE QUESTION of material standards is a most important element in national preparedness for reducing the time factor in reaching quantity production of military equipment and supplies. Without these standards, there would be much delay, not only in production of semi-fabricated materials but also in processing them through the various stages of manufacture to the finished article.

A comparison of the time necessary to reach full production with that required for training of combat forces emphasizes the importance of early quantity production in a national emergency.

The records of 1917 and 1918 show that the supply of critical articles of military equipment, guns, ammunition, tanks, gas masks, and aircraft lagged far behind the training of man power. Of two million men in the theater of military operations at that time, the average time of training was nine months, six at home, two in rear areas in France, and one in a quiet sector. Initially, essential items of equipment, such as rifles and mobile artillery, were available for one-half a million men. Equipment from new production could not be had in time to equip our men, and we were dependent on our Allies to complete it. Supplies of our own manufacture did not come through in quantity until the early spring of 1919, two years after the declaration of war, compared to the nine months' average training of men in the combat forces.

Modern war is no longer a conflict of armed forces alone. No one escapes its direct or indirect hardships. It is almost axiomatic that victory goes to the belligerent first able to throw into the struggle and maintain the whole organized man power backed by its full economic power converted to war purposes.

Huge reserves of military equipment are costly to obtain, and costly to maintain. A small reserve of material, backed by the reserve in productive capacity of industry, is the most economical plan. In that case, the reserve on hand would need only to be large enough to meet requirements until supply could be had from new production.

If our nation were unfortunately forced into a major war emergency, it is believed that no insuperable task would face our industry. It has capacity to support any industrial war effort. But to accomplish this task would require time, and time is one thing that cannot be gained back. Once past, it is lost. In peace procurement programs, $1^1/_2$ to 2 yr. are required for delivery of many highly important items of equipment. Even with the concentrated effort of industry in an emergency, needs for military equipment and supplies for much greater war emergency requirements could not be met in very much less time.

In 1917 and 1918, it was realized that mobilization of our national resources to the war effort was essential. Since 1918 the importance of industrial mobilization has largely influenced the plans of the General Staffs of the world. At Munich, a mere threat of potential aircraft production by Germany ready to support her air fleet in being was effective. Germany there demonstrated the efficiency of a plan as a means to obtain an objective without war. Since that time Germany has obviously shown that her industrial plans were not mere paper plans, but meant material delivered when needed. The lesson to the United States is clear. A sound industrial plan, plus sufficient equipment in being, provides a potent instrument for peace.

Considerable stocks of guns and equipment were left on hand in 1919 as a war reserve. But much of that equipment is obsolescent in the light of experience of today. The automotive equipment of that period has long been antiquated. Speeds of transportation have increased tremendously from those of 1918, on good roads up to 20 miles per hour, to present speeds of 50 and 60 on the ground, and 200 and more by air. Artillery carriages of that period are being high speeded. New designs of artillery have greater range and flexibility in action. The manually operated shoulder rifle has been superseded by the semiautomatic rifle, much easier to fire, and capable of a far greater rate of fire. Development of radio has revolutionized the means of communication. Anti-tank guns of greater power are required. The equipment necessary to control anti-aircraft artillery fire against fast flying planes is highly complicated. New and modernized equipment has been added as funds made available permitted. But even those increments do not provide sufficient modern equipment to bridge the gap—and cover industry—until new production can meet requirements of a major effort. And now, thought as to the amount and kind of equipment is changing overnight. Not long ago a program of 5500 airplanes for the Army was considered a reasonable measure of national defense. Today, a much greater number is being mentioned as a suitable quantity to have on hand for defense purposes.

Planning to Reduce the Time Factor

Planning, insofar as procurement of materiel for the Army is concerned, has for the past 20 years been directed toward reducing the time factor in supply from new production. In that planning four questions presented themselves for solution and answer:

1. What is wanted?

This has been answered by the development and adoption of articles suitable for the purposes as standard equipment. Material standards are a highly important consideration in the answer to this question. Further comment on this phase is made later in this paper.

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[1] Presented at the Forty-third Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 24–28, 1940.

[2] Planning Branch, Office of the Assistant Secretary of War.

2. How many are wanted and at what rate?

This question has been answered by computation of requirements. The mobilization of man power, assembled in the necessary military units, is determined by the Army General Staff. The supply requirements for these units are then computed by the supply branches of the War Department in Washington. They are the Air Corps, Chemical Warfare Service, Corps of Engineers, Medical Department, Ordnance Department, Signal Corps, and Quartermaster Corps.

As there are some 70,000 items on the supply lists of these services, an idea of the magnitude of the requirements problem is manifest. These computations consider the initial equipment of troops, the time mobilized, wastage allowances for equipment worn out or expended, tariff of sizes for clothing, and stocks being transported through for the pipeline of supply. Requirements also consider the needs of the Navy for such items as rifles, machine guns, and their ammunition, which are supplied to the Navy by the Army.

3. Where can the equipment be obtained?

The answer is found by a survey of industry and use of the small capacity of government manufacturing arsenals and depots. In a major effort, over 90 per cent must be produced by industry.

With the program of requirements in hand, industry is approached through the Procurement Planning District organizations of each supply arm and service. There are some 58 such organizations. Of these, 14 are Ordnance, 4 are Signal Corps, and the other supply branches have varying numbers in between. The continental United States is divided by each procuring service into districts which are suitable to their needs when compared to the manufacturing industries located in each area. New York City, for example, has a District Headquarters for each of the seven supply arms and services. Districts have a skeletonized staff consisting of a prominent civilian business man, an executive officer of the Regular Army, and such clerical personnel as may be required. In time of war the districts will be expanded and have as many of the procurement functions as can be decentralized from Washington.

The District has certain defined responsibilities in planning for decentralized war procurement. Initial apportionments of the procurement requirements are made to each district. Technical information for the manufacture of the article, including drawings, specifications, and quite often a description of manufacture prepared by a Government arsenal, if it is a strictly noncommercial item, is made available. The Regular Army executive surveys his area for sources of supply under the direction of his District Chief, who is acquainted with the key industrial men in that area. Together with the cooperation of the plant management, the executive studies the potentialities of each plant believed suitable for war production. In accordance with the general policy, he plans for only half or less of the potential capacity, so as to leave the remainder for normal production to meet the civilian requirements, and also to avoid dislocation of normal production to which the manufacturer must return after war.

The Chief of the supply arm or service, with the data resulting from this preliminary survey by the district, requests the Assistant Secretary of War, who is charged with the supervision of business relations of the War Department both in peace and war, to allocate the capacity needed by his particular service to produce the required articles. This matter brings to the front coordination of other supply agencies so that they will not be bidding against each other for the output of the selected producers. The interests of the Navy, our first line of defense, are protected by coordination through the Army and Navy Munitions Board of which I will speak a little later. Through this procedure some 20,000 plants have been surveyed and approximately 10,000 selected as potential prime contractors for the manufacture of items of military equipment which are expected to present difficult problems of procurement in an emergency.

4. How can these supplies be obtained in the time and quantity desired?

The ability of the manufacturing plant to produce these noncommercial articles is the key to this question. The procedure so far has located a source of supply and has indicated a brief examination of the plant for the production of the desired article. What is now desired is a definite, realistic schedule of production which the plant may be expected to meet under the conditions which may exist in war. That involves a detailed plan for manufacture—requirements of machine tools and other manufacturing equipment, sources of raw and semifinished materials, requirements for labor, power, and transportation. That work is usually done by the plant management in cooperation with the District Office. When all details are settled, the manufacturer is prepared to sign an accepted schedule of production. This is not a contract, but an acceptance by the manufacturer of his part in war production programs.

The District plans must be flexible enough to change with industrial conditions and possible changes in war requirements. It is obvious that static plans would be more or less useless. They must be constantly revised to keep abreast of the times. Industry is changing and these plans must change to accord with it. Note that the procedure so far has not given the plant actual experience in the manufacture of the article.

Production and Educational Orders

The best plans that would serve to save time would be actual production orders in the plant of the item they are expected to make in war. The aviation industry, which manufactures all aircraft required by the Army, is thoroughly conversant with the technique required in its manufacture on the present quantity basis. Plans for further expansion of this industry are now given much publicity. Some three times the present capacity is reported to be necessary to provide a potential capacity of 50,000 military airplanes a year. Other than for aviation, it may be said that sizable orders have been placed with some 50 companies during the past year for military equipment or its components. These do not include the many sub-contractors involved, which may run as high as 50 to 60 for each prime contract.

The educational orders, which were authorized for the first time last year, are next best. At the present date, 105 educational orders have been placed for 58 items which are strictly of a noncommercial nature and in plants

which are not familiar with their manufacture. Educational orders require the manufacture of a small quantity of the item by quantity production methods, but provide only a small portion of the manufacturing equipment which is necessary for the quantity which is contemplated for war production in that particular plant. They are intended to definitely establish the technique of manufacture, to provide a factory plan based on that experience and a skeleton set of manufacturing equipment. The factory plan will cover all the elements necessary to convert the plant to full quantity production. It is estimated that quantity production would be advanced from 4 to 12 months in those plants which have experience through educational orders.

Production Studies

The next possibility is the preparation of production studies which are in reality factory production plans, but without any actual manufacture of the item. Until this year funds were not available to purchase such studies. Many companies, appreciating the importance of rapid production in an emergency, spent considerable sums of their o[illegible] on such plans. During the present year a few production studies are being purchased. Only in a few cases do they provide for even so much as one set of gages or jigs. No additional manufacturing equipment is purchased on these orders.

There are some 1200 items, or separate processes of manufacture, of military equipment that present particularly difficult problems for procurement in an emergency. Approximately half of these are similar to articles normally produced by industry. The remaining half are distinctly noncommercial and have not been produced in quantity by industry in recent years.

Some 2000 plants would be involved as prime contractors for the manufacture of these distinctly noncommercial items. The extension of programs to establish the "know how" of manufacture in these plants is highly important as a means of reducing the time factor in getting to quantity production.

Many difficulties arose during the World War of 1917 and 1918 in connection with contracts. Some of the litigation growing out of them required years to settle. The necessity for contract forms designed to be fair to both Government and contractor and to eliminate profiteering has resulted in a continuous study in recent years to draft proper forms. In September, 1939, six war contract forms were approved by the Assistant Secretary of War for use in any national emergency.

All of the above steps are taken in an effort to squeeze the water out of plans and make them realistic as to certainty of performance.

The Economic Picture

However, procurement planning to answer the four questions mentioned earlier does not completely assure that the equipment will be available from production in the event of a major emergency. Vast amounts of materials, services, labor, and manufacturing equipment would be needed in a national emergency to say nothing of power and transportation. All of these must be available to the producer if he is to carry out his schedules. Consequently, studies are also made of factors entering into the whole economic picture, with a view to having available a suggested procedure which could be put into effect. That is the second phase of planning. The Planning Branch of the Office of the Assistant Secretary is charged with making such studies. They are coordinated through the Army-Navy Munitions Board with the Navy, other Federal departments and agencies, and with industry.

Munitions Board

The Army and Navy Munitions Board is the senior joint agency between the Army and Navy for dealing with and rendering decisions upon industrial planning problems which require coordination of the Army and Navy activities and preparation of studies involving mobilization of industry as may be required in an emergency. The Board was established by joint action of the Secretary of War and Secretary of the Navy. It consists of the Assistant Secretary of War and the Assistant Secretary of the Navy assisted by such committees as are considered necessary for its planning activities. The personnel of the committees consists of Army and Navy officers and such civilian experts as may be called in an advisory capacity. The Army and Navy Munitions Board was given official recognition by Congress in legislation authorizing the purchase of critical and strategic stock piles, as designated by the Board. By Executive Order of the President on July 5, 1939, the Army and Navy Munitions Board reports directly to the President as Commander-in-Chief of the Army and Navy.

Among some of its activities are studies regarding steel capacity of the nation as compared to war requirements. This particular study undertakes to discover requirements of steel for all purposes in a national emergency and to compare the steel manufacturing capacity against this requirement. In war, steel must be available to manufacturing plants with the least possible delay. This study proposes a plan for its supply where needed. Machine tools constitute a choke point in the manufacture of critical items of military equipment. Consequently a study was undertaken to compare requirements of machine tools for the manufacture of military equipment in war with available capacity of the machine tool industry. The raw materials so vital to our peacetime life may not be so readily available in war. Continuous studies are made to devise ways and means of meeting war requirements. Certain strategic materials are not available in sufficient quantity from our domestic sources. These materials are:

Strategic Materials (14)

Antimony	Mercury	Rubber
Chromium	Mica	Silk
Coconut shell char	Nickel	Tin
Manganese, ferrograde	Quartz crystal	Tungsten
Manila fiber	Quinine	

Others are critical as to volume of supply, and plans must be made to assure an adequate supply for emergency use. The materials considered critical are:

Critical Materials (15)

Aluminum	Iodine	Platinum
Asbestos	Kapok	Tanning materials
Cork	Opium	Toluol
Graphite	Optical glass	Vanadium
Hides	Phenol	Wool

Recently, for the fiscal year beginning July 1, 1939, $10,000,000 was appropriated for the purchase of stockpiles of strategic and critical materials by the Treasury Department to be held as a reserve in the event of a national emergency. Purchases have actually been made of tungsten, optical glass, chromium ore, pig tin, manganese ore, quinine, quartz crystal, and manila fiber. Rubber is being acquired from Great Britain in exchange for cotton.

Industrial Mobilization Plan

The Army and Navy Munitions Board coordinates allocation of industrial production facilities between the Army and Navy in order to prevent duplication of effort in obtaining sources for manufacture by the two departments. The principal duty of the Board has been to prepare studies leading toward recommendations for industrial mobilization of the nation. In the World War of 1914 to 1918, economic coordination by the Government touched both the humblest home and the greatest of our industries. The will of the people was such as to surrender many privileges to the "super-agencies" created for the War emergency only, so as to insure national unity in the prosecution of that war. How to devise the best plan for coordination of all the elements of our national economy for war effort is a single great problem that has been studied for many years. The Industrial Mobilization Plan of October, 1939, approved jointly by the Assistant Secretary of War and the Assistant Secretary of the Navy, was finally evolved. It is the third revision of this plan. It is not secret or confidential and can be obtained for ten cents from the Superintendent of Documents, Washington, D. C.

Briefly, it recommends the creation under the President of temporary executive agencies, the principal one being a War Resources Administration to secure coordination of the economic life of the nation, with a view to unified effort for winning of any war in which this nation may unfortunately become involved. It is based upon cooperation rather than compulsion. True, the war powers of the President exist and may be used if necessary, but they are for use only on the recalcitrant.

The plan provides that this organization will be run by civilians. The military man will enter into the economic coordination picture only to the extent of presenting Army and Navy needs and policies to the super-agency. Studies made during peacetime by the ANMB will be supplied for its information and for such other use as they may desire. The plan is based upon experience of the World War of 1914 to 1918, and studies have been made since that time to improve what are considered to be defects in that organization. The ANMB would function as liaison between the Army and Navy and this super-agency.

The Industrial Mobilization Plan is actually a study with recommendations. It is a guide to be available in time of major war. It would apply only for the duration of such a war. It attempts to anticipate the difficulties of a future war based upon considerations of past experiences. It aims to overcome such difficulties promptly and effectively in any future war in which our country unfortunately may become engaged.

This study does not propose the modification of any of our constitutional processes. Indeed the prime purpose of procurement planning and of the Industrial Mobilization Plan is the protection and continuation of these processes which are so basic to the peace and security of the people of the United States.

Any plan of this nature must necessarily be flexible so as to be adaptable to the particular circumstances as they arise. An Advisory Commission of seven civilian members to the Council of National Defense has recently been appointed under the authority contained in Section 2, Act of August 29, 1916, for the coordination of resources of material and production, necessary in the present larger procurement programs for national defense. Prominent civilians, familiar with the problems of industry, are placed in charge of that coordination.

In the War Industries Board of 1918, the Commodity Committees were the backbone of the structure. They provided a meeting ground for representatives of Government and of industry. So now the Industrial Mobilization Plan of 1939 recommends War Service Committees for similar purposes. Industry would be represented either by selected individuals of companies or through trade organizations. Matters concerning standards for materials will be subjects for consideration by these committees. It is contemplated in the event these committees function that use will be made of existing standards and specifications. Development of new standards and specifications may be required. It may well be that going committee organizations of technical societies may be asked to undertake such work.

Standards for Materials

The question of materials standards is a highly important one in the determination of what is wanted. Whether the article of equipment be an airplane, a tank, an antiaircraft gun, cloth for uniforms, or field mess equipment, the materials used must insofar as possible be commercially available in quantity. Even armor plate is not made in army arsenals but is a commercial product. If the best material is not so available, then the requirement must provide for substitute material. In some cases the strict performance requirements for distinctly military requirement are such that special materials are required, and sometimes treatments not used normally by industry are required. The positive policy of the War Department is to adhere insofar as possible to the basic requirement of commercial availability of materials. Before any design of equipment is approved, a statement is required of the supply branch of the War Department charged with its development as to the materials in it, which would be difficult to obtain either because of quantity or processes involved in manufacture.

There are some 660 specifications listed in "The Index of U. S. Army and Federal Specifications used by the War Department" for materials, many of which are no doubt of interest to the American Society for Testing Materials. (The Index may be obtained from the Superintendent of Documents, Washington, D. C., at a cost of 25 cents.) The great majority of U. S. Army specifications are not for sale but are furnished to bidders and prospective contractors in connection with purchases. These are developed by the supply branches of the War Department, each being assigned the materials in which it has the greatest interest.

In the course of their preparation, comments are obtained from interested industries as to their satisfactoriness wherever possible. These comments may be requested from companies, technical societies, or through advisory committees consisting of representatives of industry. For example, the Signal Corps regularly consults the manufacturers, the Ordnance Department secures comments on its metal specifications through a metallurgical advisory board from industry.

In preparing U. S. Army specifications reference is made to A.S.T.M. standards or other nationally recognized specifications which may cover the same materials. Since these standards or specifications do not always contain the exact requirements nor the type or quality of material which the U. S. Army specifications intend to cover, it is not possible for the War Department to adopt these standards *in toto*. It does, however, attempt to include all of the essential technical requirements and methods of test found applicable in order that the specifications so promulgated by the War Department may be in harmony with best commercial practice. In this way, the U. S. Army specifications will have embodied in them all of the best thoughts as regards technical details and requirements and at the same time keep abreast of industry in its standardization program.

With reference to specific gravity of aircraft engine fuel, for example, the U. S. Army specification specifies that it is to be determined in accordance with the Method of Test for Gravity of Petroleum Products (A.S.T.M. Designation: D 287 – 39). In general, references to A.S.T.M. standards and those issued by other technical bodies, especially those concerning tests of materials, are frequently specified throughout the Army specifications.

In addition to technical details which are applicable to the War Department only, the U. S. Army specifications must cover other details such as rules regarding inspection, grading, and marking. It is also necessary that the War Department exercise complete control over its specifications in order that revisions may be readily made and special conditions imposed that are required for War Department purchases.

Recently A.S.T.M. Committee B-5 on Copper and Copper Alloys undertook the coordination of its standards for certain non-ferrous materials, with those of the War Department. The committee obtained direct contact through War Department representation in its membership. As a result your series of standards for non-ferrous materials will be extended to include revised requirements for cartridge brass and new specifications for gilding metal, cartridge case cups, and bullet jacket cups. Other standards for non-ferrous materials will be coordinated with requirements considered necessary for military equipment.

The War Department endeavors to keep abreast of industrial standards for materials, not only by reference to published national standards, but also by taking part in the committee work of technical societies doing work on standards and specifications. The A.S.T.M. has very definitely expressed its desire to cooperate to the fullest extent with the War Department in standardization work and has invited active participation by War Department representatives in its committee work. By invitation of your Society the War Department is now represented on ten of your committees and other appointments are being made. It is represented also on 36 Sectional Committees functioning under the procedure of the American Standards Association, as well as on committees of other technical societies. Advisory Committees also perform a very useful function. Two such committees of the Society of Automotive Engineers have for many years given much assistance to the Ordnance Department in the development of combat vehicles and tires resistant to puncture by bullets.

There are three other types of specifications used by the War Department in addition to those of the U. S. Army, namely, Tentative Specifications, Federal Specifications, and AN-Aeronautical Specifications.

Tentative specifications are used by the supply branches of the War Department: first to try them out in actual purchase, to determine satisfactoriness of the specification; and second for nonrecurring purchases of material or equipment. These specifications do not bear the same numbering series as the formal U. S. Army specifications, nor are they included in the Index of U. S. Army Specifications.

Federal Specifications for use of all Federal Departments and agencies are prepared by the Federal Specification Technical Committees consisting of representatives from the interested departments working under the direction of the Federal Specifications Executive Committee. The War Department is represented on 65 of these 70 Federal Committees. Proposed Federal Specifications are coordinated with industry by the committee, and with all Federal Departments through the Federal Specifications Executive Committee. This series of specifications also follows industrial practice whenever possible. U. S. Army specifications are not prepared for materials covered by Federal Specifications.

Within the past two years a series of Joint Army-Navy Specifications for use in the procurement of materials and equipment for the air services of the Army and Navy was initiated through the Aeronautical Board. They are known as AN-Aeronautical Specifications and are mandatory for the Army Air Corps. Joint Army and Navy Committees also prepare common technical data to be included in the U. S. Army and in the Navy Specifications for gun forgings and propellent powders.

Insofar as materials for military supplies are concerned, the published standards of technical societies and trade organizations which are acceptable to industry and in accord with military requirements will be of the greatest value. Equally important is the work of the National Bureau of Standards in establishing commercial standards covering grades and quality of materials and in the development of simplified practice recommendations to reduce or limit the number of varieties and sizes of products.

The problem of further simplification and extension of commercial standards to cover additional items whether for military or civilian use is one of growing importance at the present time. The Director of the National Bureau of Standards in speaking before the Thirtieth National Conference on Weights and Measures early this month called attention to the necessity of reducing the varieties of steels and their alloys in order that production may be increased for National Defense purposes.

In view of the important role that standards can and will play in speeding up production in an emergency it is not unlikely that organizations which devote part or all of their efforts to standardization may be called upon to expand and expedite any of their programs which will accelerate production of necessary items of equipment, materials, and supplies.

The American Society for Testing Materials, a national technical society, which has for its purpose the promotion of the knowledge of materials of engineering and the standardization of specifications and methods of testing, is in an excellent position to make an important contribution in the field of standardization. If called upon to do so, it can very readily and promptly establish any new standards for materials which may be required for speeding up production and at the same time help to conserve essential raw materials. Certainly in war, conservation of materials will be most important. The adoption of any standards with this objective in view, or the reduction of varieties of the standards themselves for nation-wide use, would be most effective as a measure to save and divert materials to any war effort.

In connection with the development of proper standards to cover materials needed in an emergency, one other important point should be emphasized. This has to do with the inspection of materials to determine whether or not they comply with the technical requirements of the standards or specifications on which contracts are based. Present plans for inspection of materials contemplate expanding inspection organizations in each procuring branch of the War Department. Qualified inspectors will be needed and if legal restrictions will permit, civilian organizations qualified to perform inspection work may be called upon to do this work. It is believed that members of the A.S.T.M. who are engaged in this particular field of activity can render a great service in the inspection and testing of materials.

There are a great number of organizations in the United States actively engaged in standardization work covering many fields. In the event the nation is faced with a major emergency, it may be expected that activities of these societies and organizations, especially of leading organizations such as A.S.T.M., will be of great assistance in bringing it to a successful conclusion.

1941 Annual Meeting in Chicago; Spring Meeting in Washington

After considering various matters affecting a selection of a city for the 1941 (Forty-fourth) Annual Meeting of the Society and also the 1941 Spring Meeting and A.S.T.M. Committee Week, the Executive Committee has selected Chicago for the former and the Spring Meeting will be held in Washington, D. C. The annual meeting will be held on June 23 to 27, inclusive, at the Palmer House and in connection with this will be the Society's Sixth Exhibit of Testing Apparatus and Related Equipment and probably its Fourth Photographic Exhibit. The dates for A.S.T.M. Committee Week, to be held at the Hotel Mayflower, are March 3 to 7, inclusive; the Spring Meeting will be held on Wednesday, March 5.

Technical features of the Spring Meeting are expected to include a Symposium on Sub-Sieve Particle Size Measurement and a Symposium on the Use of Color in the Testing of Materials, each of which will be sponsored by committees of the Society. A general committee on arrangements under the chairmanship of G. E. F. Lundell with H. S. Rawdon as secretary, both from the National Bureau of Standards, has been organized. Serving on the committee are a number of prominent members in the Washington district. Others may be called on to serve in connection with the meeting.

While no definite commitments have been made concerning the features of the technical program for the Chicago meeting, a number of symposiums and groups of technical papers will be developed. Committee E-6 on Papers and Publications will consider these matters at its next meetings. There is in prospect a further discussion on the mechanical properties of materials and a symposium on mineral aggregates, and several other topics will be developed.

This will be the third annual meeting which the Society will have held in Chicago, the first two having been in 1931 and 1933. Members who will recall the very "hot" reception on those two occasions will be interested to know that the Palmer House's function rooms are air-conditioned and that there are quite a number of sleeping rooms which are air-conditioned.

The Chicago District Committee will constitute the local committee on arrangements. E. R. Young, Climax Molybdenum Co., has been elected chairman of the Chicago group with C. E. Ambelang continuing as secretary and J. de N. Macomb as vice-chairman.

Doctor Fieldner Receives High Honor

During the recent commencement exercises at Ohio State University, Past-President A. C. Fieldner, Chief, Technologic Branch, U. S. Bureau of Mines, Washington, D. C., was awarded the Joseph Sullivant Medal. This medal is a memorial to Joseph Sullivant, pioneer educator and member of the University's first Board of Trustees. It was established in 1921, a gift from the late Dr. Thomas C. Mendenhall, member of the first engineering faculty and a trustee for many years.

It is awarded every five years for "a really notable piece of work in either the Liberal, the Fine or the Mechanic Arts, including the various branches of engineering." . . . It is to "offer recognition by means of a practically imperishable record, of an admittedly notable achievement on the part of a son or daughter of the University whether that achievement be in the form of an invention, discovery, contribution to science, practical solution of a significant Engineering, Economic, or Agricultural problem or the production of a valuable literary, artistic, historical, or philosophic work."

Doctor Fieldner will be the fourth on whom this honor has been conferred by the University, the others being the late Benjamin Garver Lammé, M.E., '88; Charles F. Kettering, M.E., in E.E., '04; and Arthur Schlesinger, Arts, '10.

Measurement of the Flow Temperature of Thermoplastic Molding Materials

By L. W. A. Meyer[1]

EDITOR'S NOTE.—This paper provides a background and describes some of the work leading up to the Tentative Method of Test for Measuring Flow Temperatures of Thermoplastic Molding Materials accepted at the annual meeting and assigned the serial designation D 569 – 40 T.

ONE OF the most important properties of thermoplastic molding materials from the manufacturers' and molders' viewpoints is the temperature at which the plastic is soft enough to tolerate mechanical mixing or forced flow into all parts of any given mold. Many devices have been proposed to determine this temperature.

The problem of setting up a standard test method which is not too involved yet yields reliable and usable data is complicated by the facts that there are many types of thermoplastic materials and that the flow temperatures extend over a wide range. This situation can be successfully met by setting all conditions affecting the softness of a plastic, except the temperature, constant and then varying the temperature until a defined consistency or flowability is reached. Such a means of approach in which cellulose acetate plastics were tested with a Rossi-Peakes flow tester was described in a paper presented at the Society's Symposium on Plastics (1938).[2]

The results showed sufficient promise as a practical test method to warrant the testing of a number of plastics in several available flow-measuring devices and a program was arranged by Subcommittee III, Section D on Flow Temperature of Thermoplastic Materials, of the Society's Committee D-20 on Plastics.[3]

The following types of molding materials were tested: acrylate, polystyrene, vinyl co-polymer, cellulose ether, cellulose acetate. The flow-measuring devices utilized in running the tests were: Rossi-Peakes Flow Tester, Mooney Shearing-Disk Plastometer, Dillon Extrusion Plastometer (modified), Williams Parallel Plate Plastometer (modified).

The Rossi-Peakes flow tester[4] is an extrusion type plastometer. Materials being tested are extruded into an orifice $^1/_8$ in. in diameter and $1^1/_2$ in. long from a charge chamber $^3/_8$ in. in diameter and $^3/_4$ in. long, which is below and concentric with the orifice. Pressures up to 3000 psi. in steps of 100 psi. are applied mechanically from the bottom by a steam-heated ram. The orifice is machined into a split cone which is clamped into a steam-heated block. All temperature readings are taken by a thermometer well drilled $1^1/_4$ in. deep into the split cone. Means are provided for regulating and measuring the temperature and for recording the flow of materials in relation to time from the beginning to the end of the test. In the tests, dry specimens $^3/_8$ in. in diameter and $^3/_8$ in. high were used. The specimens at room temperature were inserted into the hot-charge chamber and a pressure of 1500 psi. applied immediately. After 2 min., the amount of flow in inches was noted. Each material was run over a temperature range and the temperature at which the material flows exactly 1 in. into the orifice was determined graphically. This was reported as the "flow-temperature."

The Mooney plastometer[5] measures the "shearing viscosity" of thermoplastic materials. Specimens are sheared between a rotating corrugated disk (rotor) 1.5 in. in diameter and 0.218 in. thick, and a corrugated mold (stator) 2 in. in diameter and 0.418 in. deep, surrounding the rotor. The mold is made in two sections, each being provided for heating to any desired temperature and so designed that when closed under the action of a powerful lever system the material is automatically cut and molded to proper form. Constant pressure within the mold is maintained with two plungers activated by springs. The shearing viscosity is measured on an arbitrary scale (in units of 0 to 250) depending on the torque resulting when the disk is rotated at a constant rate of 2 r.p.m. in the confined mass of plastic material. In the tests two specimens 2 in. in diameter and 0.2 in. thick, one of which has a $^5/_8$-in. hole in the center to permit the spindle of the rotor to pass through, were used. The dry specimens, after having been preheated at the testing temperature for 4 to 5 min., were placed in the hot mold, one above and one below the rotor, and after $^1/_2$ min. the mold was closed. The mold surfaces had previously been brushed with calcium stearate powder to prevent undue sticking. After from 3 to 5 min. the rotor was started and continued to run until a constant torque reading (shearing viscosity) was obtained. Each material was run over a temperature range and the temperature at which the shearing viscosity is exactly 100 was determined graphically. This was reported as the "relative plasticity."

The modified Dillon extrusion plastometer[6] measures the extrusion rate of plastic materials through an orifice $^1/_{16}$ in. in diameter and $^3/_{16}$ in. long from a steam-heated charge cylinder $3^1/_2$ in. long and $^3/_4$ in. in diameter above

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

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[2] C. H. Penning and L. W. A. Meyer, "Flow Relations of Thermoplastic Materials," Symposium on Plastics, p. 23, Rochester Regional Meeting, Am. Soc. Testing Mats. (1938). (Available as separate publication.)

[3] A Method of Test for Measuring Flow Temperatures of Thermoplastic Molding Materials was proposed by Committee D-20 at the Society's 1940 Annual Meeting and accepted by the Society for publication as tentative, carrying the Serial Designation D 569 – 40 T.

[4] U. S. Patent No. 2066016 issued to L. M. Rossi and G. L. Peakes—assigned to the Bakelite Corp.

[5] Melvin Mooney, "A Shearing Disk Plastometer for Unvulcanized Rubber," *Industrial and Engineering Chemistry*, Analytical Edition, Vol. 6, No. 2, p. 147 (1934).

[6] J. H. Dillon and N. Johnston, "The Plastic Properties of Several Types of Unvulcanized Rubber Stocks at High Rates of Shear," *Physics*, Vol. 4, No. 6, p. 225 (1933).

J. H. Dillon, "A Simplified Extrusion Plastometer for Unvulcanized Rubber," *Physics*, Vol. 7, No. 2, p. 73 (1936).

and concentric with the orifice. The throat of the orifice is conically shaped with an apex of approximately 90 deg. Pressures are applied to the cylinder from the top by a heated ram $^1/_2$ in. in diameter and having a hemispherical end of $^1/_2$ in. radius. The ram travels from the top of the cylinder to within $^1/_{16}$ in. of the orifice. Means are provided for measuring and regulating the temperature, accurately timing the test period, and weighing the amount of material extruded during this period.

In the tests $22^1/_2$ cu. cm. ($22^1/_2$ g. × sp. gr.) of the dry material was charged into the cylinder at the desired temperature, and preheated for 10 min. under a pressure of 500 to 700 psi. A pressure of 3025 psi. was then applied continuously until the plunger reached a point of from $^1/_8$ to $^1/_{16}$ in. less than maximum travel. During this period at the higher pressure the time was accurately determined and the amount of material extruded was weighed to the nearest centigram. The extrusion rate in cubic centimeters per minute was calculated from these data. Each material was run over a temperature range and the temperature at which the extrusion rate is 10 cu. cm. per min. was determined graphically. This was reported as the "extrusion temperature."

The modified Williams parallel plate plastometer[7] measures the rate of deformation of materials between a stationary lower plate large enough so that the compressed specimen does not reach the edge or any obstruction of the plate and a movable circular upper plate having a lower surface area of 1 sq. in. and a thickness sufficient that in no case does a deformed specimen meet a change in diameter or an obstruction. The upper plate is movable through a distance of 0.55 in.—travel is accurately measured with a dial gage—and the machine is equipped with a spacer which allows compression to 0.475 in. A net pressure of 15 psi. is applied to the specimen. A temperature-controlled bath of oil or other appropriate liquid is used as the heating medium. Means are provided for accurately timing any desired deformation as indicated by the distance of travel of the upper plate. In the tests dry specimens $1^1/_4$ in. in diameter and $^1/_2$ in. thick, with abrasive paper of the same diameter and 0.007-in. thickness placed with abrasive side in contact with the top and bottom surfaces of the specimen, were used. The dial gage was adjusted to zero reading with the two thicknesses of abrasive paper in place and with the full pressure applied. After inserting the specimen and locating the spacer, the full pressure of 15 psi. was applied and the whole device immersed in the bath at the desired temperature. After 10 min., during which time temperature equilibrium had been reached and the specimen had been compressed to a thickness of 0.475 in., the spacer was quickly withdrawn and the time necessary for compression to 0.100 in. was noted. Each material was run over a temperature range and the temperature at which exactly 100 sec. is required for the defined plastic deformation was reported as the "plastic temperature."

In each of the four methods described, dry specimens were tested, all machine parts coming in contact with the plastics were well cleaned between runs, and all variables except temperature were set constant. This means that in each case the temperatures at which the plastics had reached the same consistency or flowability were determined. Since different plastic types have different temperature coefficients of flowability, the relative flowability as here determined will not necessarily hold when the constants are changed. Results of the tests are given in Table I.

TABLE I.—EXPERIMENTAL RESULTS.

All results are from one machine, except where indicated.

Type and Designation	Rossi-Peakes Flow Tester—Flow Temperature, deg. Cent.	Mooney Shearing Disk Plastometer—Relative Plasticity, deg. Cent.	Modified Dillon Extrusion Plastometer—Extrusion Temperature, deg. Cent.	Modified Williams Parallel Plate Plastometer—Plastic Temperature, deg. Cent.
		Acrylate		
1	169.6[a]	182.0	...	...
2	156.1[a]	169.0	...	...
3	153.9[a]	173.0	...	...
4	146.4[a]	160.5	...	...
		Polystyrene		
5	135.9[a]	129.5	172.0	177.0
6	125.1[a]	121.5	154.3	145.6
7	112.5[a]	112.5	146.6	142.7
		Vinyl Co-polymer		
8	128.1[b]	141.0	158.7	170.0
9	120.4[b]	130.0	145.6	162.5
10	119.2[b]	124.0	141.4	149.5
11	118.5[b]	122.0	135.5	157.3
12	107.5[b]	111.5	129.8	134.9
13	104.0[b]	112.0	128.4	133.3
14	99.6[b]	106.0	122.4	144.7
		Cellulose Ether		
15	138.4[b]	136.1	157.2	...
16	131.3[b]	123.9	156.7	...
17	128.2[b]	122.2	159.3	...
		Cellulose Acetate		
18	151.7	155.0	178.3	...
19	150.8[c]	150.6	179.4	153.5
20	148.3[c]	149.0	174.0	165.7
21	140.8[c]	141.1	166.7	144.6
22	140.5[c]	143.3	166.9	150.5
23	138.9	141.5	166.8	148.7
24	136.7[c]	141.7	164.9	141.8
25	134.8[c]	139.4	161.3	148.7
26	131.3[c]	132.2	159.4	144.8
27	126.7	129.0	...	160.1
28	124.6	127.0	162.8	153.8
29	123.9	126.0	155.8	171.0

[a] Average of results from two machines.
[b] Average of results from three machines.
[c] Average of results from four machines.

In Fig. 1 the flow temperature as determined with the Rossi-Peakes flow tester is plotted against the relative plasticity as determined with the Mooney shearing disk plastometer. The curves for each plastic type, represented by the broken lines, as well as the average curve, represented by the solid line, have been drawn as straight lines having slopes of unity. Therefore, in the equation for a straight line

$$Y = mx + b$$

where Y = the flow temperature in degrees Centigrade,
x = the relative plasticity in degrees Centigrade,
m = 1, and
b = −3 C. (average).

This may be expressed as:

Flow temperature = relative plasticity −3 C.

This conversion ratio is accurate to approximately ±10 C. When more accurate conversions are wanted a

[7] Ira Williams, "The Plasticity of Rubber and Its Measurements," *Industrial and Engineering Chemistry*, Vol. 16, No. 4, p. 362 (1924).

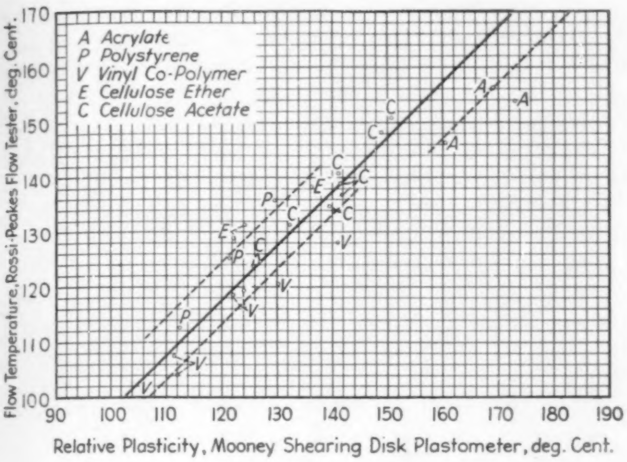


Fig. 1.

specific ratio must be set up for each plastic type. The b values suggested are:

Type of Plastic	b Value
Cellulose acetate	− 3 C.
Cellulose ether	+ 4 C.
Polystyrene	+ 4 C.
Vinyl co-polymer	− 7 C.
Acrylate	−13 C.

The amount of data present here is not sufficient to establish definitely the conversion ratios, but by testing a sufficient range of materials of any given plastic type, accurate ratios can be established. It is possible that when more information is available, the curves for widely different plastic types might be found to differ somewhat from those given in slope or even in shape.

In Fig. 2 the flow temperature as determined with the Rossi-Peakes flow tester is plotted against the extrusion temperature as determined with the modified Dillon extrusion plastometer. Here, as in the previous case, the curves for each plastic type as well as the average curve have been drawn as straight lines having slopes of unity. The average conversion ratio is the same except for the b value and may be expressed as:

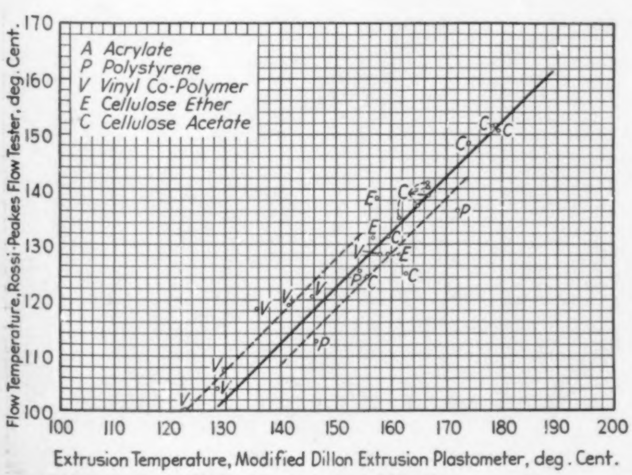


Fig. 2.

Flow temperature = extrusion temperature −28 C.

which is accurate to approximately ±5 C.

When more accurate conversions are wanted a specific ratio must be set up for each plastic type. The b values suggested are:

Type of Plastic	b Value
Cellulose acetate	−28 C.
Cellulose ether	−28 C.
Polystyrene	−32 C.
Vinyl co-polymer	−23 C.
Acrylate	...

As in the previous case accurate conversion factors can be established by testing a sufficient range of materials of any given plastic type. Also, it is possible that when more information is available, the curves for widely different plastic types might be found to differ somewhat from those given in slope or even in shape.

In Fig. 3 the flow temperature as determined with the Rossi-Peakes flow tester is plotted against the plastic temperature as determined with the modified Williams parallel plate plastometer. The points are too widely scattered to suggest an average curve. However, there

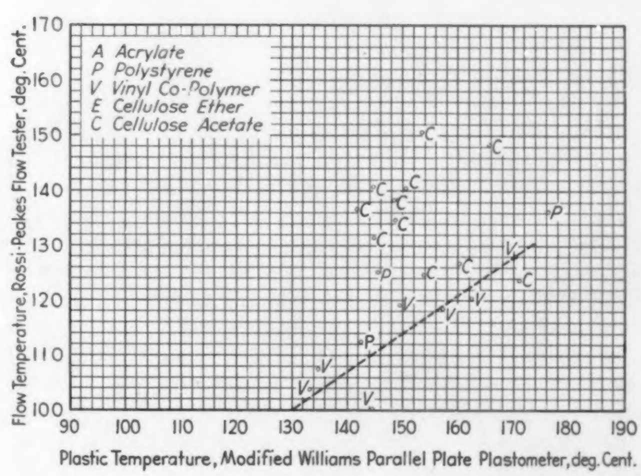


Fig. 3.

seems to be some order to the vinyl co-polymer and polystyrene materials. It is quite possible that conversion ratios can be established for similar groups of materials; that is, groups in which the difference in composition is not in the basic materials but in their ratio.

The following conclusions can be drawn: It is possible accurately to correlate the flow temperature as determined with the Rossi-Peakes flow tester with the relative plasticity as determined with the Mooney shearing disk plastometer and with the extrusion temperature as determined with the modified Dillon extrusion plastometer for groups of materials of similar composition. The data available show deviations of approximately ±10 C. from the overall average curves drawn as straight lines with slopes of unity and expressed as:

Flow temperature = relative plasticity −3 C.

and

Flow temperature = extrusion temperature −28 C.

However, it is possible that when more information is available, the curves for widely different plastic types might be found to differ somewhat from those given in slope or even in shape.

No simple correlation is suggested between the plastic temperature as determined with the modified Williams parallel-plate plastometer and the data determined by the other methods except in special cases. It is possible that with groups of materials quite similar in composition, correlations can be established.

Not all types of thermoplastic molding materials were tested nor was a sufficient number of plastics of each type tested. All of the experimental values except those obtained with the Rossi-Peakes flow tester were determined on only one machine so that the accuracy of the machines or methods is not apparent.

This investigation has shown that several methods of determining plasticity or flowability at molding temperatures give comparable results when temperature is the variable. Considerably more work, both on materials and methods, is necessary before accurate correlations can be expressed.

This paper has been made possible by the cooperation of (1) R. A. Boyer of Ford Motor Co., J. H. Adams of Bakelite Corp., D. L. Gibb of Dow Chemical Co., and L. W. A. Meyer of Tennessee Eastman Corp. who ran tests with the Rossi-Peakes flow tester; (2) Bjorn Anderson of Celluloid Corp. who ran tests with the Mooney shearing disk plastometer; and (3) L. M. Currie and M. C. Reed of National Carbon Co. who ran tests with the modified Dillon extrusion plastometer and with the modified Williams parallel plate plastometer.

Materials were furnished by Carbide and Carbon Chemicals Corp., Celluloid Corp., E. I. du Pont de Nemours and Co., Monsanto Chemical Co., Dow Chemical Co., and Tennessee Eastman Corp.

Southern California Members Have Excellent Meeting

Featured by an address on "The Use and Application of the Spectrograph for the Study of Minerals, Metals and Gases" and a lecture and demonstration at the Griffith Planetarium on the subject "Around the World with the Sun," a most successful meeting of the A.S.T.M. Southern California District Committee was held on May 10 at the Riverside Drive Breakfast Club, Los Angeles.

The *Chairman* of the committee, John Disario, Metallurgist, Columbia Steel Co., and E. O. Slater, Vice-President and Manager, Smith-Emery Co., *Secretary*, were in charge of the arrangements for the meeting. There were 148 people at the dinner, the great majority attending the planetarium lecture. In addition to many A.S.T.M. members, associates, and guests, invitations had been extended to members of the American Chemical Society, the American Society of Civl Engineers, and the American Society for Metals.

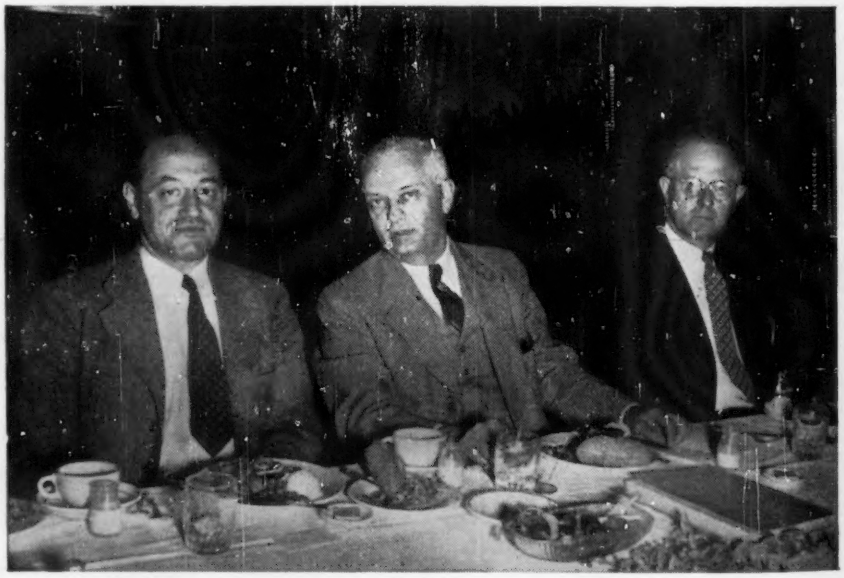
Use of the Spectrograph

The main address at the dinner on the use of the spectrograph was delivered by Dr. Rudolph M. Langer, research fellow in the field of physics, California Institute of Technology. An outstanding authority in this field, Doctor Langer handled his talk in a most interesting manner, passing a number of small spectroscopes among the audience who then followed Doctor Langer's instructions in training these on a series of differently colored tubes which had been previously arranged. Actually seeing spectrum lines and other characteristics of spectra made the talk "real" to those who were not too familiar with the field of spectrographic analysis.

Doctor Langer predicts that in another ten years all scientific men will be familiar with spectroscopy which is in line with the intense interest in this subject being exhibited in a great many fields in connection with the Society's work. He pointed out that with different spectrums in the system of elements positive identification is unmistakable. He also referred to the very small sample necessary in connection with spectrographic analysis.

Between 7 and 10 per cent of male adults' eyes are insensitive to certain colors of the spectrum, he said, while curiously enough women's eyes seem capable of more complete spectrum readings. As a rule, red and violet colors are more difficult to discern than the green. All humans are insensitive to colors beyond the red at about 7000 Ångström units, but that causes no difficulty, for infrared photography has solved that problem admirably as does photography in the ultraviolet field.

All the elements, stated Doctor Langer, found on earth also have been found present in the sun, of which this planet was once a part, according to the belief of many



Left to right: R. M. Langer, John Disario, and E. O. Slater.

scientists. All stars contain certain of the elements, but only the earth and its sun contain identical elements. In the field of astronomy the spectroscope has made possible the determination of the sun's temperature and the temperatures of other more distant suns; in fact, the measurement of heat was one of the initial applications of the spectroscope. The spectroscope has aided astronomy further with determinations of pressures, magnetic fields, distances, and rates of approach or recession of astronomical bodies.

The extreme accuracy of the modern spectrograph makes it of inestimable value to the metallurgist who can make analyses using small portions and still arrive at quantitative applications. While accuracies within 5 per cent have been achieved on some 70 of the elements, ultra accuracies of one 10,000th of one per cent have been made in some instances. It is possible to arrive at 90 determinations per man-hour in some cases.

Planetarium

The lecture at the Griffith Planetarium on "Around the World with the Sun" was given by Dr. Dinsmore Alter, Director. The skies as they appear in the northern and southern hemispheres were shown and described by Doctor Alter as the audience sat in the 75-foot circular room and the planetarium projected the images of stars and planets across the dome. A "trip around the world" started at Hollywood at sunrise "May 12" and continued throughout that day eastward around the globe showing the sun's position in the skies at the instant of sunrise in Hollywood.

Note.—Much of the information and the cut used in this article were obtained from an interesting news account of the meeting appearing on pp. 16 to 18 of the May issue, *Pacific Chemical and Metallurgical Industries*.

A Spring Suspended Spherical Bearing Block for Compression Tests

By L. J. Markwardt[1] and R. F. Luxford[1]

Advancement in the technique of compression testing has led to the general use of some form of suspended spherical bearing block, with the object of improving the loading conditions and facilitating the necessary bearing block adjustment. The purpose of this article is to describe briefly two bearing block designs; one particularly adapted for testing materials such as wood, and one for more rugged work where protection from dust and grit is essential.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

[1] Principal Engineer, and Senior Engineer, respectively, Forest Products Laboratory (maintained at Madison, Wis., in cooperation with the University of Wisconsin), Forest Service, U. S. Department of Agriculture.

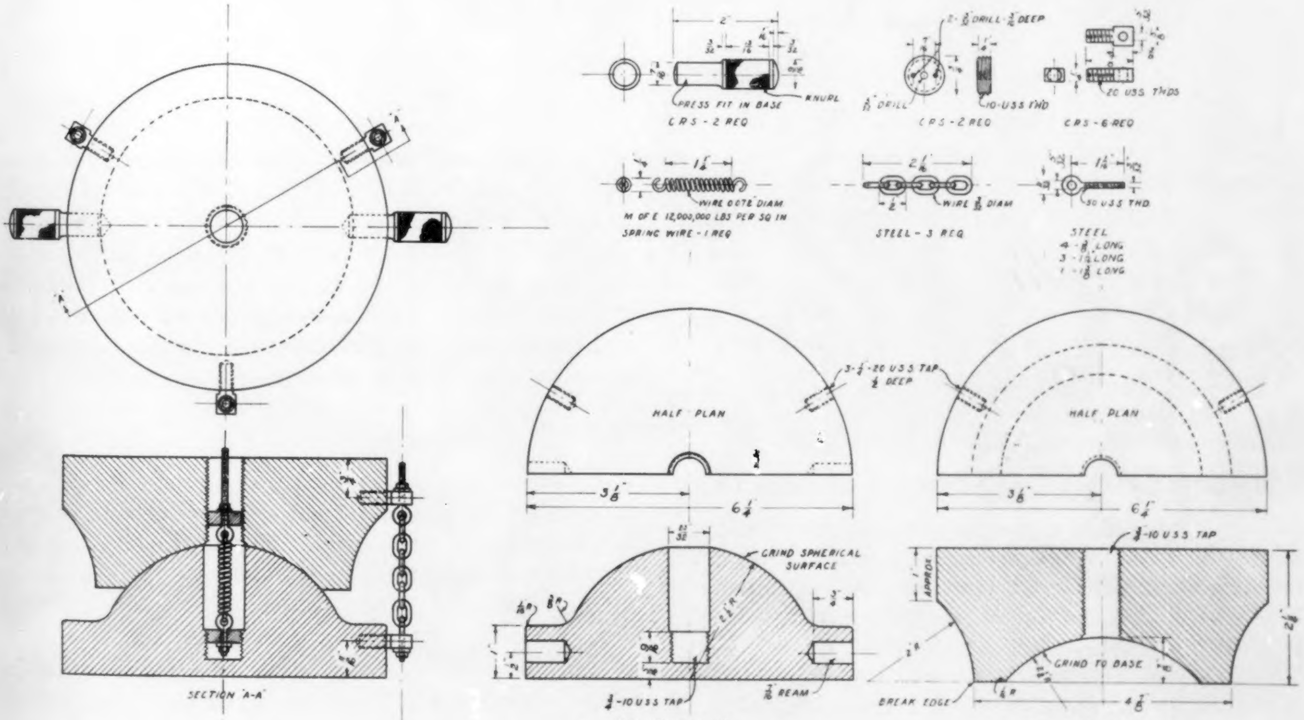


Fig. 1.—Spherical Bearing Block.

Bearing Block for Wood Tests

For wood tests, the authors have experimented with a number of bearing blocks differing mainly in the method of suspension. A type of block with a single helical spring for a connecting element and with the center of the spherical surface at the center of the loading face has been used with satisfaction for a number of years at the Forest Products Laboratory. The details are shown in Fig. 1 for a unit $6^1/_4$ in. in diameter. Two pins are provided to facilitate handling. The three interconnecting chains are tightened to protect the spring when the bearing block is moved or handled. Other sizes have also been constructed and used.

In operation, the bearing block is attached to the head of the testing machine with the spring adjusted so that the lower section hangs free, with a very small clearance. When a small clearance is provided, a misalignment obviously occurs if the loading surfaces of the test specimens are appreciably out of parallelism, or if the planes of the ends are not perpendicular to the axis. In tests of wood, the ends of the compression specimens are usually very accurately cut, and any such difficulty is avoided.

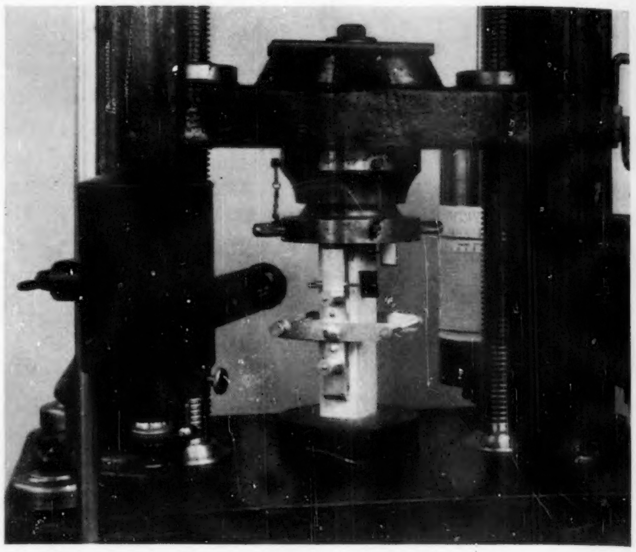


Fig. 2.—Testing Wood for Compression Parallel to the Grain.

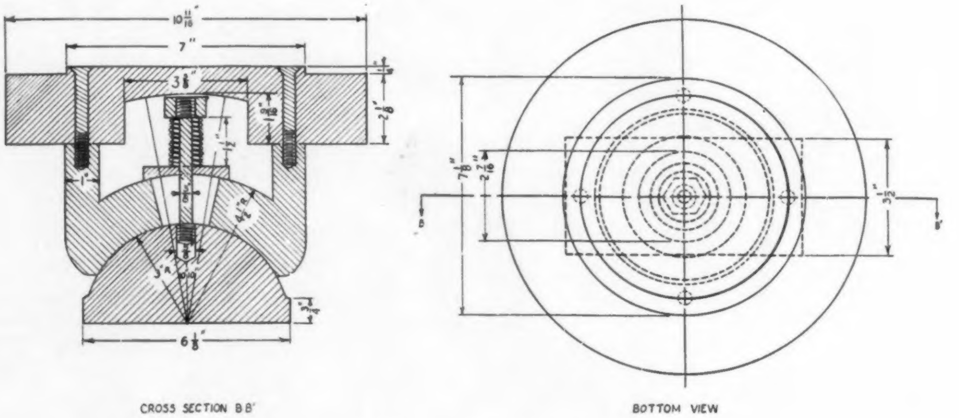


Fig. 3.—Spherical Bearing Block.

A method of conducting the compression parallel-to-the-grain test of wood is illustrated in Fig. 2, for the standard 2 by 2 by 8-in. prism. The suspended spherical bearing block is shown in conjunction with a Lamb's roller compressometer for measuring the average deformation over a 6-in. gage length.

Bearing Block for Masonry Tests

For compression tests of masonry the bearing block designed by Kurt F. Wendt, of the University of Wisconsin, as shown in Fig. 3, has proved particularly satisfactory. The male and female portions are maintained in articulation by a substantial spring, yet the block is self aligning under small loads. Protection against the entrance of dust and grit is afforded by maintaining the bearing surfaces in contact and enclosing the spring.

Members Obtain Certificates at Reduced Cost

Quite a number of members of the Society have taken advantage of the recent reduction in cost of the membership certificate, as announced on page 42 of the May ASTM Bulletin on which there was reproduced a facsimile of the certificate.

As indicated, a price of \$1.50 applies for the remainder of the year instead of the previous charge in effect of \$2.50. The certificate when completed is an excellent piece of work and gives a very pleasing appearance when framed. A heavy grade of parchment paper is used on which the member's name, date of membership, and classification of his membership are carefully engrossed. Each of the certificates is 22 by 17 in. over all and is signed personally by the President of the Society and the Secretary-Treasurer, after which the official Society seal is affixed.

Other members who wish to secure certificates can do so by writing A.S.T.M. Headquarters and sending their remittance, making sure that they specify exactly how they wish their names to appear.

Properties of Commercial Pearlitic Malleable Iron[a]

By C. H. Lorig[1]

SYNOPSIS

The paper attempts to correlate mechanical properties of commercial, pearlitic malleable irons. Various data were secured from producers of pearlitic malleable iron and these along with data available in the literature are summarized in a table and in curves. Close relationships between tensile strength and Brinell hardness and between yield point and Brinell hardness appear to exist. In a broad sense these relationships are independent of the method of preparing the pearlitic malleable irons and are not affected greatly by the character of the combined carbon particles. Evidence indicated that the ductility of pearlitic malleable irons is affected by the microstructure more so than are the tensile strength and yield point. A short review is given of the influence of those individual alloying elements often employed in commercial pearlitic malleable irons.

In 1939, on the recommendation of Subcommittee VI on Pearlitic and Alloy Malleable Iron of the Society's Committee A-7 on Malleable-Iron Castings, the Tentative Specifications for Pearlitic Malleable Iron Castings (A 220 – 39 T)[2] was published. Pearlitic malleable castings, according to these specifications, should be known and listed by classes on the basis of minimum yield point and elongation. This method of classifying pearlitic malleable castings will probably be revised when sufficient information is available to give more specific limitations. At the request of Committee A-7 producers of pearlitic malleable iron have been asked to supply quantitative information on the various commercial products. The information obtained and that which was already available on pearlitic malleable irons have been correlated in this paper.

Pearlitic malleable iron is distinguished from the standard malleable by the character of the matrix. This distinction resides in the fact that pearlitic malleable contains some carbon in the combined form, whereas the standard malleable contains, generally, only a minute quantity of combined carbon. The pearlitic malleables differ in properties as their matrices differ. The significant amounts of combined carbon in pearlitic malleable make it stronger, harder, and less ductile than standard malleable iron.

The term "pearlitic" describing the class of malleable iron mentioned in this paper is generic and is by no means identified only with malleable irons in which the matrices contain pearlite, but refers to irons manufactured to contain more or less a prescribed amount of combined carbon in any form. Thus Z-Metal, for example, which is characterized by a spheroidized form of combined carbon in the matrix comes within the classification of so-called pearlitic malleable iron.

Manufacture of Pearlitic Malleables

Pearlitic malleables are made from white cast irons which are usually of standard malleable analysis or sometimes modified by alloying additions. To render the irons pearlitic three methods are now in commercial use. The irons, both of the unalloyed and alloyed types, may be given one of two special heat treatments which comprise, in one case, of arresting the graphitization during the second stage thus retaining some carbon in the combined form, and in the other, of completing the graphitization and subsequently heating above the lower critical point to recombine some of the carbon. In the third method alloying elements are added and in such amounts as would fit the irons into the regular anneal.

The alloying additions are employed to control the amount of combined carbon retained in the matrix. To a lesser extent they are used to modify the properties. Among the retarding elements are manganese, the most widely used of all elements and frequently employed in amounts somewhat above 0.6 per cent, molybdenum which seldom exceeds 0.5 per cent, and chromium which is very infrequently used and then in amounts considerably under 0.5 per cent. To counteract the stabilizing effect of chromium and to speed the decomposition of massive cementite in the first stage of malleablizing, additional silicon is sometimes used. The only other commonly employed element is copper, often added to increase corrosion resistance, though it also affects the malleablizing treatment favorably and increases the yield point, tensile strength, and hardness of the iron.

The additions are usually made in the ladle where they improve the structure and properties of the annealed white iron by their alloying effects. In air furnace practice the ladle treatment also produces effects which cannot be realized when the same amount of alloys is added to the original charge. The late addition of manganese, for example, produces more beneficial results than if the additional manganese was added to the charge (*1*).[3] Ladle additions are desirable in most commercial operations since standard malleable and pearlitic malleable are usually produced from the same heat. In a few cases where the electric furnace and other types of small melting units are employed no ladle additions are used. One manufacturer has taken advantage of the fact that iron melted in the electric furnace responds differently in the anneal than does air furnace iron. His annealing practice is designed and the composition of the iron is chosen accordingly. In this case the combination of electric furnace melting and continuous annealing in a tunnel kiln is considered of prime metallurgical importance in control of analyses and physical properties.

There are, according to a tabulation in the Symposium on Pearlitic Malleable Cast Iron (*2*), from fifteen to seventeen distinct pearlitic malleables in common use, some of which differ in manner of production rather than in properties. This symposium classified pearlitic malleables for the purpose of study and discussion into two major divi-

[a] Presented at the Forty-third Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 24–28, 1940.

[1] Metallurgist, Battelle Memorial Institute, Columbus, Ohio.

[2] 1939 Book of A.S.T.M. Standards, Part I, p. 981.

[3] The italic numbers in parentheses refer to the reports and papers appearing in the Bibliography appended to this paper.

TABLE I.—CHEMICAL COMPOSITIONS AND PROPERTIES OF COMMERCIAL PEARLITIC MALLEABLE CAST IRONS.

The following data are regarded as probable average values but should not be used as the basis of specification.

Material	Chemical Composition, per cent				Other Elements	Classification by Process		Heat Treatment Schedule	Tensile Strength, psi.	Yield Point, psi.	Elongation in 2 in., per cent	Brinell Hardness	Source of Information
	Carbon	Combined Carbon	Silicon	Manganese		Division	Class						
Z-Metal													
Broad range	2.00 to 2.60	0.30 to 0.80	0.90 to 1.10	0.75 to 1.25	May contain alloying constituents up to approximately 2%, principally Cu or Mo or both. In high C irons sometimes Cr. 0.06 to 0.10% S and 0.10 to 0.15% P	I	A and B	Graphitize at 1720 F.; air quench to temperature below critical, *e.g.*, 1000 to 1200 F.; spheroidize at temperature somewhat below critical, *e.g.*, 1280 F.; air cool[a]	70 000 to 90 000	48 000 to 60 000	18 to 8	155 to 255	Osborg (*3*)
Straight Z-Metal		Normal				I	A		81 600	53 600	12	155 to 195	Osborg (*3*)
Cu-Z-Metal		Normal			Up to 1.0% Cu	I	B		80 500	56 500	13	180 to 200	Osborg (*3*)
Cu-Mo-Z-Metal		Normal			Several tenths of 1% Cu and Mo	I	B		87 800	56 300	10	195 to 225	Osborg (*3*)
Soft Z-Metal	2.30		1.00	0.70	0.08% S, 0.16% P	I	A	20 hr. to 1720 F., 24 hr. at 1720 F., 1 1/2 hr. cool to 1100 F. 6 hr. heat to 1280 F. 30 hr. at 1280 F. 3 hr. cool to 70 F.	68 000	47 000	15	155	Forbes (*4*)
Hard Z-Metal	2.30		1.00	1.00	0.08% S, 0.16% P	I	A		84 000	58 000	10	187	Forbes (*4*)
Gunite-K	2.30		1.00	0.70	0.08% S, 0.16% P	I	A	20 hr. to 1720 F. 24 hr. at 1720 F. 4 hr. cool to 70 F.	97 000	75 000	4	227	Forbes (*4*)
Mallix	Not stated				Retarding element	I	B	Not stated	78 000		6		Schwartz (*5*)
ArMaSteel	2.65 to 2.75	Up to 0.65	1.25 to 1.35	0.38 to 0.42	0.15% S, 0.05% P	I	A	Air quenched from 1650 F.; reheated to 1600 F. for 20 min., oil quenched, drawn 1 1/2 hr. at 1250 F.				229	Joseph (*6*)
								Air quenched from 1650 F., drawn 8 hr. at 1250 F.				179	Joseph (*6*)
								Oil quenched and drawn	108 000	95 000	1.5	285	Joseph (*6*)
								Oil quenched and drawn	105 000	90 000	2.5	269	Joseph (*6*)
								Oil quenched and drawn	95 000	82 000	4.0	241	Joseph (*6*)
								Not stated	80 000	50 000	5.0	187	Joseph (*6*)
Promal	Not stated, though usually of standard malleable composition				Some grades are alloyed. Alloying elements not stated	II	A	Full annealed; reheated to 1475 F. followed by a quench and draw	70 000 to 75 000	50 000 to 55 000	10 to 14	170 to 190	Symposium (*2*) and Lauenstein (*7*)
Belmalloy[b]	Standard malleable composition with additional manganese and molybdenum					I	B	Standard malleable anneal in continuous furnace	70 000 to 80 000	45 000 to 50 000	5 to 10	179 to 207	Anderson (*8*)
Belectromal[b,c]	Standard malleable composition with copper and molybdenum							Standard malleable anneal in continuous furnace	70 000 to 60 000	45 000	15 to 20	145 to 170	Anderson (*8*)
Perduro, typical heats	2.41	0.40 to 0.60	0.90	0.51 to 0.64	0.78 to 1.10% Cu, 0.08% S and 0.143% P	II	B	Full annealed, reheated above lower critical, quenched and drawn	91 000	72 500	6	187 to 217	Lemmon (*9*)
	2.40	0.40 to 0.60	0.92	0.57 to 0.68	1.08 to 1.13% Cu, 0.08% S and 0.143% P								
Super-Y[c]	Standard malleable composition plus two alloying elements. Alloying elements not stated							Standard malleable anneal of 96 hr.	60 500 to 64 000	46 000 to 48 500	19 to 23	145	Wise (*10*)
Meehanite													
Cupola	2.7 to 2.9	...	1.0	0.35	Under 0.15% P	I	A	Heat treatment No. 1 24 hr. at 1700 F. Cool in air to 1350 F. 24 hr. from 1350 to 1200 F., air cooled	45 000 to 55 000	30 000 to 35 000	6 to 10	140 to 190	Symposium (*2*)
Air furnace	2.4 to 2.6	...	1.0	0.35	Under 0.15% P				55 000 to 65 000	35 000 to 42 000	10 to 15	140 to 170	Symposium (*2*)
Cupola	Same as above					I	A	Heat treatment No. 2 24 hr. at 1700 F., cool rapidly in air	65 000 to 90 000	45 000 to 55 000	1.5 to 4.0	200 to 240	Symposium (*2*)
Air furnace	Same as above								80 000 to 100 000	50 000 to 65 000	2.0 to 5.0	210 to 250	Symposium (*2*)
Cupola	Same as above					I	A	Heat treatment No. 3 24 hr. at 1700 F. Quench in oil. Draw at various temperatures to desired hardness	80 000 to 100 000	50 000 to 60 000	1.0 to 2.0	250 to 300	Symposium (*2*)
Air furnace	Same as above								90 000 to 120 000	65 000 to 80 000	1.0 to 2.0	250 to 350	Symposium (*2*)
Cu-high Mn													
Grade 45009[d]	2.40	0.20	0.95	0.95	0.065% S, 0.17% P, 1% Cu	I	B	Standard malleable anneal	60 000	45 000	9		Symposium (*2*)
Grade 53007[d]	2.40	0.40	0.95	1.15	0.065% S, 0.17% P, 1% Cu	I	B	Standard malleable anneal	70 000	53 000	7		Symposium (*2*)
Grade 60005[d]	2.40	0.68	0.95	1.35	0.065% S, 0.17% P, 1% Cu	I	B	Standard malleable anneal	80 000	60 000	5	210	Symposium (*2*)
Ni-Cr Alloy													
Grade *S*	Not stated							Not stated	62 000	42 000	24	130	Symposium (*2*)
Grade 42	Not stated							Not stated	70 000	50 000	15	180	Symposium (*2*)
Grade Jewell Alloy	Not stated							Not stated	90 000	60 000	8	200	Symposium (*2*)
Grade *V*	Not stated							Not stated	85 000	70 000	5	250	Symposium (*2*)
High silicon	2.15 to 2.5	...	1.30 to 1.70	0.35	0.05% S, 0.05% P May contain Mo or Ni			Variable. May be cooled through critical in furnace or oil quenched	55 000 to 115 000	41 000 to 80 000	15 to 4	150 to 260	Symposium (*2*)

[a] Temperature for graphitizing any charge of Z-Metal is adjusted in accordance with size and wall thickness of casting. A special technique is applied during spheroidizing if so-called network structure is desired. [b] Electric-furnace iron annealed in a continuous tunnel kiln. [c] A special type of completely graphitized malleable iron. [d] Approximate analysis and minimum properties.

sions, namely, division I, metal produced by interrupting graphitization before completion, and division II, metal produced by reheating completely graphitized alloys. The divisions may be further subdivided into class *A*, metal having a composition similar to that of malleable iron in which the retention of combined carbon is due to a shortening of the annealing cycle, and class *B*, metal to which various retarding elements have been added to secure a retention of combined carbon even with reasonably extensive heat treatment. The classification further types the irons according to various metallographic forms of the combined carbon and to the distribution of the ferrite and decomposed austenite.

By regulating the heat treatment of pearlitic malleables containing no primary cementite it is conceivable that materials of almost any desired combined carbon content up to eutectoid composition can be produced. Metallurgically the products made by interrupting the graphitization and by reheating the completely malleablized iron above the A_1 point differ, principally in microstructure, when recombination of carbon in the reheated, malleablized castings is incomplete. The differences in microstructure disappear, however, when recombining of the carbon reaches the eutectoid carbon content, and when the metal is alike in composition and subsequent treatments are the same.

Both the above heat treating methods for producing pearlitic malleables lend themselves to the making of materials with the same range of properties. By variations in each of the heat treating methods the form and amount of carbides may be varied. It becomes possible, therefore, to produce different types of pearlitic malleables with physical properties that vary from those of standard malleable to those with a tensile strength about 125,000 psi. and an elongation of 2 to 3 per cent.

As a rule, tensile strength and elongation or ductility vary inversely, though this relationship is by no means precise, for ductility is more dependent on the form of the combined carbon and its distribution in the matrix than is the tensile strength. Tensile strength and combined carbon content of pearlitic malleables appear to be closely related and each in turn seems to bear a close relation to the hardness. This is not the case with ductility. Evidence thus far obtained seems to bear out the point that a matrix in which the combined carbon is spheroidized is, generally speaking, more ductile than is a sorbitic matrix, and that the latter is more ductile than is a coarsely lamellar pearlitic matrix. These variations in ductility with microstructure are noted for irons of approximately identical tensile strengths and combined carbon contents.

Correlation of Tensile Properties of Commercial Pearlitic Malleables

It is not surprising, therefore, that in the production of pearlitic malleables considerable ingenuity has been exercised in seeking to heat treat and to make compositional changes, on a scale feasible in practice, so as to obtain the highest ductility concomitant with the desired tensile strength. Much secrecy still surrounds the heat treatments and compositions being employed for some of the products. As a result, the information correlated in Table I is quite incomplete and adds little to what has already been known about pearlitic malleables. The properties in

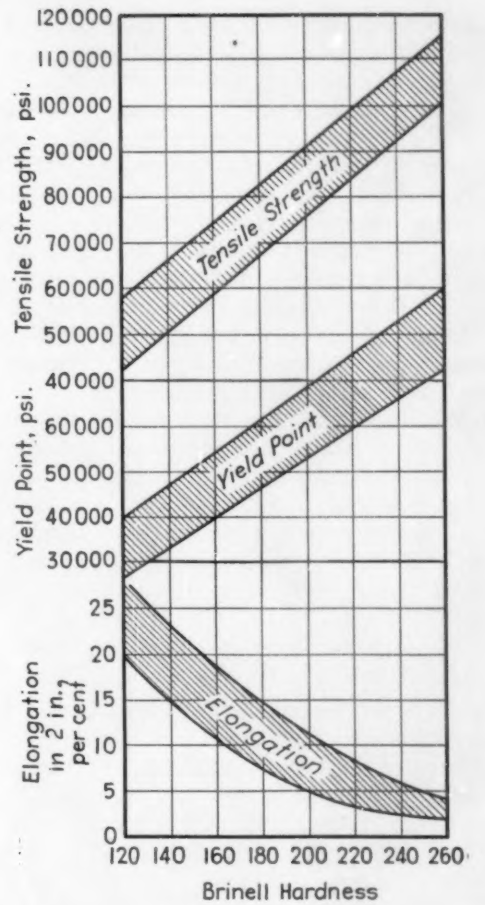


Fig. 1.—Relationship of Tensile Properties of Commercial Pearlitic Malleable Iron to Brinell Hardness.

Table I are to be regarded as probable average values and, hence, should not be used as the basis of specification.

Figure 1 was prepared by plotting tensile properties against Brinell hardness, using the available data in Table I. The bands, extended to include properties of standard malleable, are at best only qualitative indications of trends in properties with hardness and should be accepted in that light.

Both tensile strength and yield point values varied in direct proportion to changes in hardness within the range of hardness covered. Only a few points fell outside the bands. These exceptions were principally values which were minimum figures for the irons or were for irons in which the carbon contents deviated considerably from the average. The curves indicate that the amount of graphite and the number of graphite nodules have an important effect on tensile properties while they have a less important effect on the hardness. This is well known. A somewhat better correlation doubtless could have been obtained with data from specific irons in which carbon contents were closely alike.

A proportionately greater scatter in values giving a proportionately broader band was secured when elongations were plotted against Brinell hardness values. This was expected in view of the dependence of ductility on the form of the carbide and the degree of homogeneity of the matrix, that is, on the microstructure.

Figure 1 shows that the various processes for producing pearlitic malleable irons give substantially the same tensile strength and yield point for a given Brinell hardness for any one composition. The similarity between processes does not hold with respect to ductility, for variations in ductility are realized, irrespective of the hardness or strength, due to the different microstructures associated with the various processes.

Forbes (*1*) found a somewhat similar relationship between tensile properties and the combined carbon content as has been shown above between tensile properties and Brinell hardness. His data were secured on irons of almost identical analyses except for manganese. Manganese was employed to retain different percentages of combined carbon in the irons after they were graphitized, air cooled from above the critical temperature, and spheroidized for 30 hr. at 1280 F. In form, the combined carbon in the different specimens did not differ since it existed as spheroids. Hence a close relationship was also found between ductility and the combined carbon in the irons. Figure 2 was reproduced from Forbes' paper.

Effect of Alloying Elements in Pearlitic Malleable Irons

Forbes (*1*) also showed the average properties obtained from the irons after the spheroidizing treatment plotted as a function of the manganese content. These are given in Fig. 3. In this case a straight line relationship was obtained between properties and manganese in the range from 0.50 to 1.0 per cent. This would be expected since the combined carbon content after spheroidizing increased directly with manganese content. The influence of manganese on properties is apparently directly proportional to the power of manganese to retain combined carbon in the iron after spheroidizing.

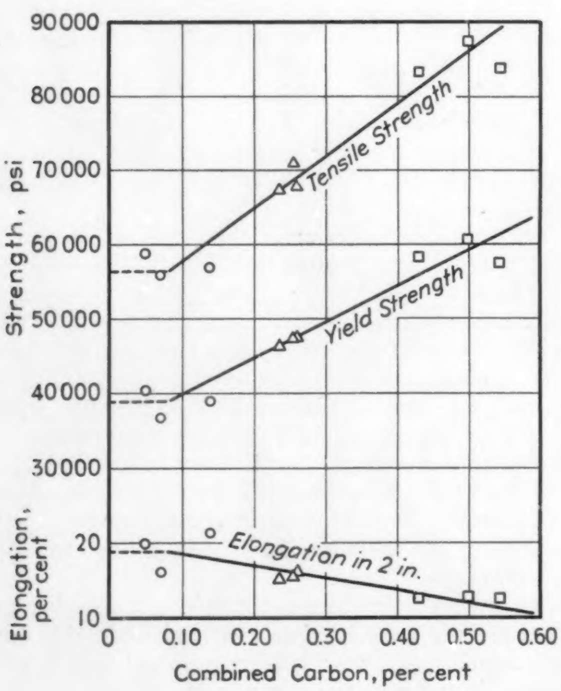


Fig. 2. Tensile Properties of Bars as Affected by Combined Carbon Content (D. P. Forbes).

Other elements commonly used to retard second stage graphitization to obtain better regulation of carbon in the combined form are molybdenum and chromium. Chubb (*11*) reported some work on molybdenum in short-cycle, heat-treated malleable iron and Hall (*12*) gave interesting data on chromium additions.

Chubb (*11*) determined the properties of three heat-treated irons of the following analysis:

Iron	Total Carbon, per cent	Manganese, per cent	Silicon, per cent	Molybdenum, per cent
No. 1.........	2.15	0.60	1.94	Nil
No. 2.........	2.03	0.60	1.94	0.41
No. 3.........	1.98	0.44	1.92	0.78

They were held at 1725 F. for 4 hr., cooled in the furnace to 1400 F., and quenched in oil. The two molybdenum irons were drawn at 1345 F., iron No. 2 being maintained at temperature for 3 hr. and iron No. 3 for 1 hr. The unalloyed iron was drawn at 1255 F. for 2 hr.

Tensile properties of the irons were as follows:

	No. 1	No. 2	No. 3
Tensile strength, psi..................	77 000	92 000	107 000
Yield point, psi.......................	58 000	75 000	88 000
Elongation in 2 in., per cent..........	4.5	6.5	5.1
Yield ratio............................	75.8	81.6	82.6
Brinell hardness.......................	194	217	255

The tensile strength and yield point values are well within the bands of Fig. 1. Molybdenum like manganese improves the strength and yield point principally by increasing the combined carbon and hence the hardness of

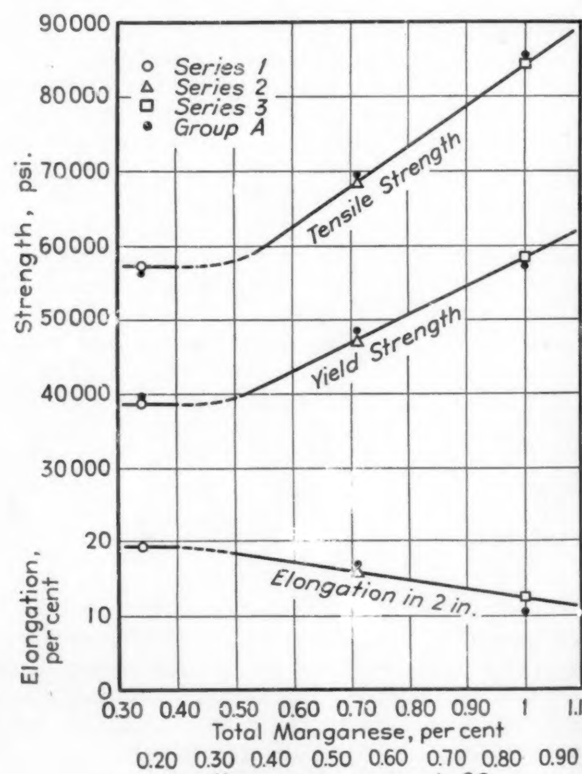


Fig. 3.—Tensile Properties of Bars as Affected by Manganese Content (D. P. Forbes).

the iron. Since the matrix was greatly refined by the molybdenum it was not surprising that the alloyed irons showed relatively high ductility values. The increase in yield ratio with molybdenum content may also be attributed, at least in part, to the refinement of the matrix.

The work of Hall (*12*) on chromium in malleable iron covered the range of chromium additions up to 1.15 per cent with additional silicon to counteract the tendency for the chromium to form stable carbides. The irons were given a standard anneal of 120-hr. duration. The range of properties obtained with chromium varying from 0 to 1.15 per cent and with corresponding variations in silicon from 1.0 to 2.0 per cent was as follows:

Tensile strength, psi	54 000	to	80 500
Yield point, psi	37 500	to	62 500
Elongation in 2 in., per cent	18.5	to	2.5
Brinell hardness	131	to	223

The matrices of the chromium containing irons were principally finely laminated pearlite with a few patches of ferrite surrounding the temper carbon nodules. A considerable amount of primary cementite was retained in the high chromium irons. This perhaps accounts for the fact that the tensile strength of the series of irons increased with chromium up to about 0.60 per cent and then decreased with higher chromium contents. In the range from 0 to 0.60 per cent chromium, however, the tensile properties were in line with those for commercial pearlitic malleables at the same Brinell hardness levels. Small additions of chromium appear to affect the properties of pearlitic malleables in somewhat the same way as increases in manganese or as additions of molybdenum.

Excepting the few cases where pearlitic malleables may contain extra silicon, the only other important alloying element or addition used is copper. Its chief effect is to increase the resistance of pearlitic malleable to corrosion in air and by certain corrosive media. Copper above about 0.50 per cent raises the tensile strength, yield point, and hardness; however, practically no quantitative information is available on the effect of copper on tensile properties of pearlitic malleables.

Other Properties of Pearlitic Malleable Iron

Impact Resistance.—Comparative impact tests (*3*) on Z-Metal and standard malleable iron resulted in the following range in impact values:

Z-Metal	30 to 15 ft-lb.
Malleable iron	15 to 7 ft-lb.

The results were obtained on a special machine similar in design to the Charpy machine but adapted for cast test specimens $^1/_2$ by $^1/_2$ in. in cross-section notched to a depth of $^1/_8$ in. after annealing.

Machinability and Wear Properties.—The machinability of pearlitic malleables as a class is said to be better than that for other ferrous products of the same hardness. In this regard Joseph (*6*), from comparative machining tests, indicated that ArMaSteel was from 20 to 40 per cent more machinable than steel bar stock and drop forgings of the same Brinell hardness. ArMaSteel machined better at lower speeds using a greater feed. The number of castings of ArMaSteel per tool grind was from 20 to 100 per cent greater than it was from similar parts made from forgings. There was also less wear on tools in broaching ArMaSteel and broaching pressures were lower.

Very little specific data on machinability of other pearlitic malleables are available. While the claims for the superiority in machinability of pearlitic malleables over forgings of the same hardness appear to find support in the machine shop, there is reason to doubt that all pearlitic malleables of the same hardness and composition have equal machining properties. The form of the carbide in the matrix, that is, whether it exists as spheroids or as lamellae in pearlite, for example, must affect the machinability of pearlitic malleable just as these various forms of carbide affect the machinability of steel.

The microstructure of pearlitic malleable, particularly when isolated patches of ferrite are absent, suggests a material of high resistance to frictional and abrasive wear and galling. Performance in service of pearlitic malleable parts seems to bear this out. However, there is little concerning wear properties of pearlitic malleables in the literature.

Corrosion Resistance.—The corrosion resistance of copper-bearing Z-Metal in various solutions was shown (*3*) to be superior to that of standard malleable iron. Tests were made by suspending the specimens under no strain of the solutions held at 80 F. Corrosion was expressed as the rate of loss of metal in milligrams per square centimeter of exposed surface over a fixed period of immersion. The results are summarized as follows:

Type of Material	Salt Water, 10 per cent Solution	Mine Water (Coal)	Sugar Cane Solution	5 per cent Sulfuric Acid	25 per cent Tannic Acid	5 per cent Lactic Acid	5 per cent Hydrochloric Acid
Z-Metal with approximately 0.75 per cent copper	0.016	0.00715	0.099	2.68	0.047	0.075	0.455
Standard malleable iron	0.052	0.1680	1.628	27.57	0.087	1.190	11.181

The results of such tests should only be accepted with reservation as they seldom are truly indicative of the behaviors of the materials in service. The character of the surface of the specimens, that is, whether it is machined or cast, is underlaid with a "picture-frame" structure, as may well be the case with standard malleable specimens, or is decarburized, also has an effect on rates of corrosion. The corrosion resistance of unalloyed pearlitic malleables can be increased by alloying.

Miscellaneous Properties.—Some of the less frequently determined properties of Promal (*7*) are given as follows:

Fatigue strength, psi	33 000
Modulus of elasticity, psi	26 000 000
Coefficient of thermal expansion, in. per inch per deg. Fahr	0.0000109
Electrical resistivity, ohms per mil-ft	211
Magnetic permeability, at 200 ampere turns	78
Specific gravity	7.35

The shear strength of Bemalloy (*8*) is reported as 60,000 psi.

Acknowledgment:

The author wishes to express his thanks to the various producers of pearlitic malleable iron for information received that made this paper possible, and to members of Committee A-7 on Malleable-Iron Castings for suggestions and encouragement received during its preparation.

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DISCUSSION

MR. H. A. SCHWARTZ[1] (*presented in written form*).—The writer wishes to express his appreciation and that of Committee A-7 to Mr. Lorig for having prepared so complete a correlated abstract of the present state of knowledge regarding the pearlitic malleables. He desires further to draw particular attention to the statement in small type below the caption of Table I cautioning the reader against using the recorded physical properties as the basis for drawing specifications. Such a table, giving what may be regarded as expected values, will of necessity exclude probably half of the production of the product since, in general, as many results will fall above as below the expected values. The result may become even worse in cases where one property goes up while the other one goes down. It is imaginable that in such a case where the correlation is close between two properties and the average value exactly determined, a specification would exclude one half the samples for one cause and the other half for another cause.

Mr. Lorig has labored under great difficulty because many manufacturers of pearlitic malleable do not wish to publish sufficiently exhaustive investigations of the properties of their product. I wish neither to condemn nor to endorse such an attitude. It is but natural that each producer should act according to his own interests in this matter as his judgment dictates. However, until more thorough and exhaustive investigation of the effect of graphitizing and other heat-treating processes on at least unalloyed white iron is available there will be no possibility of writing intelligent specifications.

A further fact to be considered is that these products are manufactured largely to suit specific purposes and it may always be necessary to keep specifications covering a rather wide range and combinations of properties.

MR. H. OSBORG[2] (*presented in written form*).—The author has rendered an invaluable service to metallurgists and engineers by presenting a critical review on so-called pearlitic malleable irons. His effort is particularly appreciated considering that in some cases but fragmentary evidence has been made available to him.

Though the common denominator, pearlitic malleable irons, does not strictly apply to all of the products included, it may serve a practical purpose to have ductile iron castings containing, besides graphite, cementite in spheroidized form tentatively included under that heading. However, it should not be overlooked that spheroidized cementite is the result of a spheroidizing treatment to which pearlitic or martensitic iron has been subjected.[3]

The author's efforts will be well rewarded if the paper serves to stimulate increased activities with a view to filling out the gaps which for the first time have become so apparent.

The ease with which pearlitic malleable irons can be machined is recognized. In order to substantiate this, the relative machinability of so-called pearlitic malleable irons was determined some time ago under strictly comparative conditions, using high-strength cast iron, malleable iron, cast steel, and a pearlitic malleable iron for such tests. The specimens for these tests were rollers measuring 11 in. in outside diameter with a 4-in. face, cast from the various materials to be tested, and properly annealed, or heat treated, bored, faced, and fitted, and were then placed between lathe centers. In the following table a condensed summary of the test results is given:

Material	Average Brinell Hardness		Average Watt Hours per Cubic Inch of Material Removed	Machinability Ratings
	Before	After		
High-strength cast iron[a]	200	181	6.31	1
Malleable iron..........	137	130	6.54	2
Cast steel[b]............	153	149	9.24	6
Pearlitic malleable iron (Z-metal)				
Straight	211	229	9.00	4
0.5% Cu...........	229	233	9.18	5
1.0% Cu...........	200	210	7.70	3

[a] About 40 per cent steel added to cupola mixture; approximately 3.15 per cent carbon, 2.10 per cent silicon, remainder of analysis normal for cast iron; samples tested in the "as-cast" state. (Range of ultimate tensile strength 40,000 to 50,000 psi.)

[b] 0.25 per cent carbon steel; samples tested in the "annealed" state.

From the foregoing, it becomes apparent that the so-called pearlitic malleable iron used in these tests machines

[1] Manager of Research, National Malleable and Steel Castings Co., Cleveland, Ohio.

[2] Technical Director, Ferrous Metals Corp., New York, N. Y.

[3] Metals Handbook, 1939 edition, p. 10, lines 2 to 7:

"Spheroidal or Spheroidized Cementite: The globular condition of iron carbide resulting from a spheroidizing treatment (see under annealing). The initial structure may be either pearlitic or martensitic.

"Note: The term 'spheroidized pearlite' should be avoided, even when the structure is undoubtedly the result of spheroidizing anneal of a pearlitic steel. The term 'spheroidite' has been proposed."

somewhat harder than the high-strength cast iron and malleable iron, but is easier to machine than cast steel even though it is much harder. Of interest also is the relative effect of the copper content on the machinability, showing a decided improvement in machinability of the copper bearing material after the copper addition has appreciably exceeded the solid solubility range of copper in the iron.

In commercial production work Z-metal having a Brinell hardness of 170 to 180 is regularly machined at higher cutting speeds (dry) than forgings of S.A.E. 1020–1030 steels which are considerably softer.

Commercial cylindrical castings having low wall ratio were subjected recently to exacting and extensive hydraulic tests. Two particular features of the various results obtained may be of interest here. It was definitely established that the pearlitic malleable iron, which in this case was of the spheroidized type, was in all cases entirely free from porosity up to the point of bursting (42,750 psi. for castings, not machined, $^7/_8$-in. wall thickness; and 25,700 psi. on machined castings, having $^7/_{16}$-in. wall thickness). When plotting pressures against the expansion of the outside diameter of the casting, the slope of the plot changes only slightly after the elastic strength is exceeded, which indicates a material that work hardens at a very great rate. Therefore, if a tension test bar is considered it becomes evident that the straining of the specimen from its elastic limit to 0.005 in. per inch strain requires a considerable increase in load. This fact accounts for the great difference between elastic limit and yield point which has been observed in this type of pearlitic malleable iron.

Inert Materials for Admixture with Paint Pigments

By Wayne R. Fuller[1]

THE SUBJECT of this paper refers to the materials commonly known as extenders. Considerations of time and the author's knowledge dictate that the discussion be confined to one phase of the subject: namely, the influence of extenders on the properties of paints.

In the mind of the layman there is a persisting suspicion that extenders are used for just one purpose: to reduce the cost. That this is one of the important, and legitimate, functions of extenders there is no denying. It is no less true that on strictly technical grounds extenders are among the most useful tools in the paint formulator's kit. This utility is being constantly enhanced by two developments: first, new and improved types of extenders; second, increased use of pigments having high hiding power, which indicates the use of larger amounts of extenders and thus increases their effect on paint properties.

The problem would be simplified if we could make a neat classification of extenders on the basis of source, composition, or some single physical property and then show a direct relationship between this classification and paint-making properties. As every paint chemist knows, this scheme will not work. The author is unable to improve on the conventional classifications of extenders, one arrangement of which follows:

- Barium sulfate
  - Natural—barytes
  - Precipitated—blanc fixe
- Calcium sulfate
  - Gypsum, terra alba
  - Plaster of Paris
  - Anhydrous
- Calcium carbonate
  - Whiting—natural
  - Precipitated
    - Regular type
    - Extremely fine (Multifex)
    - Surface treated with organic acid (Surfex)
- Magnesium carbonate
- Silica
  - Quartz
    - Standard types
    - Extremely fine
  - Diatomaceous silica
    - Coarse
    - Fine
- Magnesium silicates and related minerals
  - Fibrous talc (Asbestine)
  - Plate talc
  - Pyrophyllite talc (Pyrax B)
  - Calcium and magensium carbonates and silicates (Metro-Nite)
- China clay
  - Imported English
  - Domestic
- Miscellaneous
  - Mica
  - Soapstone
  - Slate flour
  - Keystone filler
  - Pumice

Following is a partial list of the properties of extenders that influence their value and specific function in paints:

1. Particle size and size distribution.
2. Particle shape.
3. Texture, that is, whether soft and pulverent like whiting or hard like quartz silica.
4. Chemical reactivity.

   This refers not only to basicity or alkalinity but also to reactivity with vehicle because of surface treatment with polar compounds, such as Surfex.
5. Oil-absorption value.
6. Color.
7. Specific gravity.

Among the properties of paint that are affected by the kind and amount of extender are:

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communicationns to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

[1] Technical Director, The Marietta Paint and Color Co., Marietta, Ohio.

1. Settling and caking.
2. Consistency.
3. Working.
4. Flowing.
5. Drying.
6. Gloss.
7. Color.
8. Hiding.
9. Sanding.
10. Sealing or "holding out" qualities.
11. Washability.
12. Yellowing.
13. Water resistance.
14. Water sensitivity.
15. Adhesion to metal.
16. Corrosion resistance.
17. Exterior durability.

There are at least two possible approaches to the more complete development of the subject of extenders. The first is to take up each extender separately, discussing the properties that it imparts to paints and its application in various types of paint products. The second is to take up various types of paint products and discuss the advantageous use of extenders in them. The latter approach is considered the more helpful and will be followed.

Exterior House Paints

Exterior house paints furnish a concrete example of increased use of extenders as a result of the general adoption of high hiding power white pigments. Prior to the introduction of zinc sulfide and titanium pigments, first-grade multiple pigment paints were made with white lead and zinc oxide. The hiding power of these pigments restricted the use of extenders, and the amount used, based on pigment by weight, usually varied from none to 10 per cent. The general adoption of titanium-barium pigment as an added constituent of white paints did not materially alter the situation with respect to extenders incorporated as such. The extenders most widely used were fibrous talc and quartz silica, common practice being the use of these materials in equal amounts. Because of the small amount of extender used as such, it had little bearing on the durability or general performance of the paint. The adoption of titanium pigment containing 75 per cent blanc fixe (later 70 per cent) substantially increased the total extender content to a normal range of 25 to 40 per cent. However, the paint formulator had control over perhaps only 10 per cent.

At about the same time that titanium-barium pigment came into use, another type of formula was introduced. This formula was based on lithopone (composite zinc sulfide pigment containing 72 per cent blanc fixe) in combination with leaded zinc oxide and extender. A widely used formula included 20 per cent of added extender, usually equal parts of fibrous talc and quartz silica, giving a total extender content of 48.8 per cent. It is readily apparent that this type of formula represented a new high both in total extender content and in the amount at the disposition of the paint formulator. With growing recognition of the superiority of silicate pigments over quartz silica, present practice in the formulation of paints of this type leans toward the use of 15 per cent fibrous talc as the sole added extender.

When pure titanium dioxide and zinc sulfide became available, the paint formulator obtained control over the full amount of extender in the formula and the choice of extenders became a problem of greater importance. Tests demonstrated that when large amounts of extender were used they played a vital part in the durability and other properties of the paint. It was found that blanc fixe detracts from durability and that best results were obtained with silicate pigments, notably fibrous talc and mica. While mica gave even better durability than fibrous talc, it had certain undesirable properties, such as glistening in bright light, poor wetting and grinding, poor leveling, low and non-uniform gloss, and a rough film. As a result fibrous talc has become the standard extender for use in the first-grade commercial house paints made with white lead, zinc oxide, titanium dioxide, and lead titanate as the hiding pigments.

More recently diatomaceous silica of the coarse type has been advocated as an extender for house paints. The author's information is that this extender promotes good durability. Shortcomings which have retarded its acceptance are: (1) a very high oil-absorption value, which means that its use in substantial amount would require an abnormally large proportion of thinner, (2) low gloss, (3) difficulty in grinding, and (4) a cost of approximately 75 cents a solid gallon, about three times the cost of fibrous talc.

Fibrous talc merits more detailed consideration as an extender for house paints, in view of its general use as the sole extender in first-grade commercial paints. There are various grades of fibrous talc and certain grades are superior to other grades. Composite pigments are available which contain 30 per cent titanium dioxide and 70 per cent talc. These pigments are mechanical mixtures and give the same results as the same mixture when made in the process of paint manufacture. The use of talc tends to increase consistency, reduce settling, promote easy brushing, reduce leveling, and reduce gloss. Among paint chemists the view is widespread that properly balanced formulas containing a large proportion of fibrous talc are as durable as any practicable formulas that can be produced today. There is a trend toward the use of increased amounts of talc. This trend will probably be furthered by the adoption of lead titanate and types of titanium dioxide having reduced chalking, which permit the use of more titanium pigment. A natural outgrowth of this is the use of more extender.

Two of the most widely sold white house paints on the American market contain 22.4 per cent talc, based on pigment. Other well-known brands contain 35 to 44 per cent. Some authorities recommend the use of as much as 35 per cent talc for maximum durability and a range of 35 to 45 per cent depending on hiding requirements and the remainder of the formula. It is accepted today that pigment volume relationships have greater technical significance than weight relationships. It is worth noting, therefore, that in one practical formula containing 35 per cent talc by weight, the volume is 49.4 per cent, and that in another practical formula containing 22.4 per cent by weight, the volume is 37 per cent.

The early types of titanium pigments, unlike zinc sulfide pigments, imparted a marked fading tendency to tints. In consequence, they were seldom used in tints and, when used, the proportion was small. This fading tendency has been substantially reduced by the development of lead titanate and fade-resistant types of white and tinted titanium dioxide pigments. Many recent tint formulas contain one or more of these newer titanium pigments. In view of the excess hiding thus obtained,

these formulas usually include a substantial percentage of talc.

Mica also deserves detailed consideration as an extender in house paint, especially in view of a definite, favorable influence on checking, cracking, and chalking. Because of the undesirable properties previously mentioned, the optimum amount of mica seems to be about 10 per cent and the most practical range is probably 5 to 10 per cent. A cost of $1.05 per solid gallon also points toward its use in small proportion, in combination with a larger amount of talc. Good results require the selection of a suitable grade of water-ground mica. Even in the small proportion mentioned, mica reduces any tendency toward cracking failure in all types of multiple pigment paints. To date, it has been most widely recommended and employed in paints made with zinc sulfide and leaded zinc oxide. It may be conveniently introduced in the form of a composite pigment containing 50 per cent zinc sulfide, 40 per cent talc, and 10 per cent mica. One recommended house paint formula with this type of pigment calls for 6.5 per cent mica and 26 per cent talc, based on pigment.

It is realized that in practical paint formulation the use of extenders cannot be treated as a problem by itself, but must be considered in relation to the formula as a whole. Such a discussion, however, would be beyond the scope of this paper.

Exterior concrete and brick paints of the conventional oil type present an interesting problem in which extenders play a predominant part. One of the special requirements is resistance to alkali in concrete. It would be natural to assume that the controlling factor would be the vehicle and that pigmentation would be secondary. Both laboratory tests and practical experience demonstrate that the opposite is the case. Satisfactory alkali resistance may be obtained with a typical oil or varnish vehicle when 15 to 20 per cent of the pigment is calcium sulfate, either plaster of Paris or terra alba, in combination with other suitable pigments. The author is unable to offer a satisfactory explanation for this effect.

Other requirements of concrete paints are that they shall be flat and have at least a moderate degree of porosity, thus permitting breathing and escape of sealed-in moisture without blistering. An obvious means of accomplishing this is by formulating with a high pigment—vehicle volume ratio. This principle may be supplemented by the use of an extender that promotes a flat, porous film. Pumice has been used for this purpose. Diatomaceous earth extenders are recommended for this purpose and it seems that they should serve equally well, with less sacrifice of other desirable properties.

Flat Wall Paints

Doubtless the most important use of extenders is in flat wall paints, as regards both the quantity of paint involved and the amount of extenders employed. The extenders that are most widely used as such in wall paints are whiting, Surfex, fibrous talc, and diatomaceous earth. Other extenders that may be used are finely divided mica and Metro-Nite. Although calcium sulfate or barium sulfate occurs in almost all flat wall paints, they are introduced in the form of composite titanium dioxide or zinc sulfide pigments and are not ordinarily considered as extenders.

Whiting and fibrous talc may be regarded as the standard extenders for flat wall paints and doubtless constitute the bulk of the extender used. It is difficult to discuss these materials in general terms because of the wide variation in types and properties. For example, commercial grades of whiting vary in oil absorption value from 9.3 to 72. The typical grades of whiting are natural and precipitated materials in the oil-absorption range of 10 to 16. A good grade of whiting has no marked disadvantages for wall paints. It promotes good color, good flow, and a film having a smooth texture. As suggested by its oil-absorption value, it is rather low in flatting power in comparison with the other hiding and extending pigments used in flat wall paints, excepting low and medium oil lithopone. Because of its low oil-absorption value, less nonvolatile vehicle is required when whiting is incorporated. Consequently, it may be considered as replacing a portion of the nonvolatile vehicle. Since a typical grade of whiting costs approximately 25 cents a solid gallon, the result of its use is a definite economy.

Surface-treated calcium carbonate costs about twice as much as regular precipitated calcium carbonate. Notwithstanding this higher cost, it has gained wide use in flat wall paints, primarily because it imparts improved sealing properties and improved "hold out" for succeeding coats. This is explained by the polar compound, with which the particles are coated, attracting and holding the vehicle in the film, instead of permitting it to penetrate the underlying surface.

Probably the majority of flat wall paint formulas incorporate both whiting and fibrous talc. Various grades of talc have oil-absorption values from 16 to 35, but the grades commonly used in flat wall paints probably fall in the range of 20 to 25. Differences in oil-absorption value, which depend on crystalline structure, influence consistency, ease of grinding, and texture of the paint film. Fibrous talc tends to improve brushability and effects a definite improvement in pigment suspension. It helps to prevent sagging and, concomitantly, reduces leveling. In keeping with its higher oil-absorption value, talc has greater flatting action than whiting. It is almost the same as whiting in cost per gallon.

Diatomaceous silica has been recommended and used in flat wall paints. It has approximately the same cost per pound as lithopone, presents a grinding problem, gives a surface with a rough texture, and does not promote pigment suspension. Its use springs from a single unique property: exceptional flatting power. If a dead-flat finish is desired, diatomaceous silica facilitates the attaining of this result.

For several years the paint industry has heard much about high dry hiding power pigments and flats. In the case of a flat wall paint this means a product which, as it dries and flats, acquires a substantially higher hiding power than it possesses in the wet state. Special white pigments which impart this property to flat paints are available. In an article presented before the Northwestern Paint and Varnish Production Club on March 1, 1940, A. E. Jacobsen and J. G. Lundgren point out that some extenders contribute more than others to the development of high dry hiding power in flat paints. In one formula the substitution of a very high oil absorption whiting for a whiting having normal oil absorption effected a 41 per

cent increase in the hiding obtained with one pound of white pigment. At first glance this result seems to hold out promise of substantial saving in the formulation of flat wall paints. However, the substitution of extenders of the same type having higher oil absorption without increase of the amount of nonvolatile vehicle means a flatter paint and one that is inferior in "hold out" and washability. High dry hiding is caused by insufficient free binder in the paint which unavoidably leads to poor "hold out" and poor washability. By free binder is meant the excess over that required to satisfy the oil absorption of the pigments.

If it were necessary to designate one type of paint product as the one in which extenders are the most essential from a technical standpoint it would be wood fillers. Next, in order, would come metal surfaces and enamel undercoats. Time does not permit discussion of all these materials and the remainder of this paper will be devoted to enamel undercoats.

Enamel Undercoats

The primary functions of extenders in enamel undercoats are to regulate sanding, sealing, flowing, and pigment suspension. They also serve other objects, which vary in importance with the use of the undercoat.

A large number of extenders find advantageous use in undercoats for various purposes. Among these are barytes, fibrous talc, natural and precipitated whiting, Surfex, extremely fine quartz silica, diatomaceous silica, and Metro-Nite. To determine a good combination of extenders for an undercoat designed for a particular purpose may prove to be no small job. The choice will be influenced by the requirements of the undercoat, the hiding pigments employed, the kind of vehicle, and possible use of metallic soap. All that can be attempted here is to list the more important extenders and comment briefly on the properties which they contribute.

Barytes, with its very low oil absorption, favors a dense, nonporous film and fair sanding properties. It has some tendency to settle and its cost of approximately 75 cents per gallon is high for an extender. Blanc fixe is not considered here because of a cost of about $1.30 per gallon.

Fibrous talc is recommended by a cost of approximately 25 cents a gallon. It is useful in reducing flowing and sagging and in improving pigment suspension. It rates fair in sanding and "hold out" qualities.

Whiting has about the same cost per gallon as fibrous talc, good flow, and smooth texture. Sanding properties are rather poor, with a tendency to clog the paper. Surfex is similar to whiting except that it possesses outstanding "hold out" and costs about 55 cents per gallon. The poor sanding of whiting and Surfex suggests their use in combination with other extenders that will overcome this deficiency, such as diatomaceous silica or fine quartz silica.

The ordinary grades of quartz silica are not considered advantageous in undercoats because of coarseness and settling. Certain especially fine grades of quartz silica may be useful in combination with other extenders to improve "tooth" and sanding properties. Diatomaceous silica is even more effective than quartz silica in imparting tooth and overcoming a tendency for the softer extenders to clog sandpaper.

Metro-Nite is considered in the class with whiting, but superior to whiting in hardness and sanding properties.

The author is aware that this paper is sketchy and is open to criticism on grounds of scientific accuracy. It may at least help to establish the fact that extenders serve useful and important technical functions in paints, wholly apart from the question of cost.

Discussion on Particle Size Measurement

Mr. William Dowell Baten[1] (*by letter*).—In the January, 1940, issue of the ASTM Bulletin[2] appeared an article by P. M. Travis comparing readings obtained from a sedimentation apparatus and those obtained from microscopic readings. The author exhibited the two sets of readings and made the statement that there was close agreement. No effort was made to test whether there was a significant difference between the two sets of readings. The object of this article is to test for significance by use of the x^2-test.

The following table gives the readings obtained by the two methods and the necessary calculations for obtaining the value of x^2.

Microscopic Reading (500 Measurements to per cent by Volume for Comparison)		Reading as Obtained by the Sedimentation Apparatus		Difference	
Diameter, microns	Per cent by Volume (1)	Diameter, microns	Per cent by Volume (2)	(1) − (2) (3)	$(3)^2/(2)$
35 to 40	6.6	35 to 40 and above	5.5	1.1	0.2200
30 to 35	4.3	30 to 35	4.5	−0.2	0.0089
25 to 30	10.7	25 to 30	11.5	−0.8	0.0557
20 to 25	25.0	20 to 25	22.5	2.5	0.2778
15 to 20	34.8	15 to 20	29.2	5.6	1.0740
10 to 15	14.5	10 to 15	20.7	−6.2	1.8570
4 to 10	4.23	Below 10	6.1	−1.87	0.5738
Total	100.13		100.00		4.0672

The value of x^2 is

$$x^2 = \frac{\Sigma(\text{observed} - \text{theoretical})^2}{\text{theoretical}} = 4.0672$$

Entering a x^2-table[3] at $n = 6$ deg. of freedom shows that the probability P of the value of x^2 being equal to or

(*Continued on lower half next page*)

[1] Associate Professor, Department of Mathematics, Michigan State College, East Lansing, Mich.

[2] P. M. Travis, "Measurement of Average Particle Size by Sedimentation and Other Physical Means," ASTM Bulletin, No. 102, January, 1940, p. 29.

[3] R. A. Fisher, "Statistical Methods for Research Workers," sixth edition (1936).

Numerous Publications to Be Issued

List Includes Several Special Items

In addition to the so-called regular publications, including the 1940 Supplements to the Book of Standards, *Proceedings*, Year Book, Index to Standards, etc., there are a number of special volumes to be issued within the next few months.

Brief notes on some of these publications are given below for the information of the members, and a list of all of the publications, with special prices to members and other descriptive information, will be sent in the form of an order blank to each member late in September.

The special compilations of standards issued during the past few years have become of increasing significance and, as indicated below, new editions of these widely used books are to be published.

Regular Publications

1940 Supplements to Book of A.S.T.M. Standards:

In line with the new publication policy, instituted in 1939, the Supplements to the Book of Standards will be issued in three parts as follows:

Part I. Metals
Part II. Nonmetallic Materials—Constructional
Part III. Nonmetallic Materials—General

These volumes will include the newly adopted and revised standards applicable to the materials indicated in the titles of the individual parts, and will also contain the new and revised tentative standards and tentative revisions of standards. It is expected that the Supplements will be ready for distribution by November 30. Full details on the methods of furnishing these Supplements to members will be included in the September mailing.

1940 Proceedings:

This year the *Proceedings* will again be issued as one volume, containing both committee reports and technical papers, together with the discussion thereof. They will be mailed about December 15.

Index to Standards and Tentative Standards:

This Index, which continues to increase in value as the number of specifications becomes larger, will again give the latest complete references to publications where the various specifications and test methods appear. The Index is furnished to members, and is also widely distributed, on request. Members may obtain additional copies without charge. To be published about November 15.

Year Book:

Includes a list of the complete membership of the Society (name, address, company, etc.), the personnel of all A.S.T.M. committees, and other pertinent information. Furnished only to members, on request. Publication date—September 15.

Symposium on New Materials in Transportation:

The Symposium on New Materials in Transportation, held at the Detroit Spring Meeting of the Society in March, will be issued as a separate volume, and should be available about September 1.

Special Publications

1940 Marburg Lecture:

The Marburg Lecture on "Portland Cement—Theories (Proved and Otherwise) and Specifications," delivered by P. H. Bates at the annual meeting, will be included in the 1940 *Proceedings;* prior to publication in the *Proceedings*, special reprints of the lecture will be issued.

Special Compilations:

New editions of the special compilations of standards, covering specific industrial fields, will be made available during the latter part of this year. All of the A.S.T.M. standard and tentative specifications and tests in the following fields will be included in the respective volumes: cement, refractories, paints, petroleum products, electrical insulating materials, rubber products, and textile materials.

The very considerable task of bringing up to date the data in the Tables of Chemical Compositions, Physical and Mechanical Properties, and Corrosion-Resistant Properties of Corrosion-Resistant and Heat-Resistant Alloys which were issued in 1930, is now before Committee A-10, and the revised tables may be available early in 1941. It is also proposed to issue a further edition of the Index to Literature on Spectrochemical Analysis.

(*Continued from preceding page*)

greater than 4.0672 is between 0.5 and 0.7, which shows that the readings obtained by the sedimentation apparatus form a good fit to the observed data.

Mr. Pierce M. Travis[4] (*Author's closure by letter*).—The first microscopic reading referred to by Mr. Baten is for diameter of 35 to 40 μ, whereas the first sedimentation reading is for 35 to 40 μ and above. The last microscopic reading is 4 to 10 μ and the last sedimentation reading below 10 μ. It seems to me that it is not strictly proper to compare either the first or last readings inasmuch as the diameter classifications do not agree.

We also believe that the method of measuring by volume is preferred and while it is not the exact measurement it is the more consistent and uniform and for control purposes serves very well. Microscopic measurements are subject to just as many errors and take much more of the operator's time than the method by sedimentation.

[4] Consulting Colloid Chemist; President, Travis Colloid Research Co., Inc., New York, N. Y.

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Applied Democracy

As many individuals undoubtedly are doing who live in a democracy where free men govern and are governed, we are doing much thinking and plenty of speculating about recent trends in government, particularly in Europe. In an article on certain phases of the A.S.T.M. annual meeting, an editor in *Highway Builder* writes, "At a time in our World's History when freedom of speech and right to one's own opinion is being so seriously challenged, it was an inspiration to observe men .... speaking from the same floor, freely exchanging their ideas, neither hesitating to commend nor criticize their competitor's technical procedures."

During some of the very brief lulls at the meeting, we thought about this, our own democratic institution, and conjectured in what ways it might be strengthened to serve its place in industry and in assisting the Government. While many things can and are being done there is one fundamental which must ever be the basis for action: namely, there must be no apathy toward or slackening in any phases of our work. Various writers in commenting on the disintegration and fall of democratic nations have attempted to crystallize the reasons therefor. Some of the conclusions have been that in any democratic institution there must be cooperation—working together for the good of the greatest number. The preservation of a democratic institution over a period of time requires that *all* shall do their best. Both time and energy must be devoted and personal sacrifices may be necessary by every one of us. If one thing is certain, it is this—that whether any democratic institution, A.S.T.M. or U. S., is to go forward surely, *everyone concerned* must do his part. Apathy on the part of one may spread to many and apathy on the part of many over a continued period leads to disintegration.

What does this mean in A.S.T.M.? It tells us that *every member* must do his best to forward the work of the Society. We must not be content with our many accomplishments. We must press forward doing everything we possibly can to develop needed specifications and methods of testing, to promote the knowledge of materials of engineering. These purposes of the Society have come to the fore in this day, as being of tremendous importance; more important than at any time in our history as a national technical society.

From the New President

"New occasions teach new duties;
Time makes ancient good uncouth.
We must upward then and onward,
Would we keep abreast of truth."

With the close of the Forty-third Annual Meeting, the Society completed one of its most successful year's work. The publishing of the three volumes of the Book of Standards with complete change of format is no small task. In addition to this it has been a year of great committee activities. Many new specifications and a number of revisions have been made ready for publication. All this has been necessary to keep abreast of the ever-changing world in materials.

The confidence placed in the work of our Society by the industries is attested by the strong support of the nearly one thousand corporation members, as demonstrated in the earnest work of their representatives on committees and the enthusiastic response of one hundred five major industrial organizations in lending added support by accepting Sustaining Memberships.

We now look forward with confidence to a year of great usefulness. In his address (published in this Bulletin) on "Materials Standards in National Preparedness" Lieutenant Colonel Young generously acknowledged the value of A.S.T.M. specifications and recognized the ability of our Society to make an important contribution to the field of standardization.

Our desire and willingness, previously expressed, to cooperate to the fullest extent with both the War and Navy Departments in standardization work, is hereby repeated. Believing that it is the unanimous expression of the membership, I say that we stand ready at all times to serve the industries and our Government in time of peace, in any program of national preparedness, or in a national emergency.

With these few thoughts I extend greetings to the entire membership and look forward to a year of usefulness to which I pledge my earnest though humble efforts.

Wm Barr

President

Ruminations

In considering the "annual" meeting, some are prone at times to forget that it is not a single meeting, but is a series of different kinds of meetings: *first*, the formal sessions where papers are presented and the Society acts on committee recommendations; *second*, informal annual meeting sessions which may consist of round-table conferences, or topical discussions on various problems; *third*, committee meetings all day long (and far into the night sometimes); and last but certainly from the individual's standpoint not least, the informal personal and group meetings or contacts which are in progress throughout the week of the meeting in the lobbies and lounge parlors.

Considering some of these four principal types of meetings, we were impressed by the informal sessions—round-table discussions—at the meeting.

That there is a very definite place in the Society's program for round-table discussions has been recognized. There is a question whether sufficient advantage has been taken of this type of meeting to get various viewpoints and various personalities together to discuss in a preliminary way, if you will, subjects of growing importance.

The Topical Discussion on Radiographic Testing of Airplane Components was of this nature with very definite interest on the part of a large number of engineers and physicists concerned with this problem of faster, surer, non-destructive methods of assuring that a part or assemblage is sound. Another conference in the nature of a round table—under the auspices of Committee E-4—dealt with electrolytic polishing and capping, methods of preparing metallographic specimens. The interest was high and the attendance at both of these informal sessions equalled that at a number of the formal sessions.

Sessions of this nature with a give-and-take atmosphere in the interest of promoting knowledge of materials, should rank high as constructive procedure. Many groups and committees in the Society might sponsor informal sessions to advantage.

Some of the "discussion" in the lobby or lounge type of informal conference where two, three, or four men get together, would prove to be interesting reading if recorded and published. Here is where one phase of the educational significance of the meeting comes to the fore, where men working in the same field or possibly one manufacturing, another buying a commodity can exchange information and pool knowledge. A great many members of the Society have commented on the value of the informal contacts they have made in those man-to-man "sessions."

One other phase of the meeting impressed us—the large percentage of younger men taking a more active part in all phases of the meeting—committee meetings, informal discussions, and formal sessions. The records of the Society indicate that there is a steady infiltration of younger men who occupy leading places in connection with the Society's standardization and research program. The Society, particularly in its technical committee work, affords a unique opportunity for young engineers to associate with more experienced men, to learn effectively the necessity of cooperation and compromise. This is important if the Society is to go forward aggressively. It is distinctly heartening to realize that the younger men are stepping into the traces with vigor and energy to work side by side with the more experienced to keep A.S.T.M. on the forward march.

Now 105 Sustaining Members

Latest List Includes Many Leading Companies

Since April 16, when there was prepared for the May ASTM Bulletin a list of new sustaining members, 33 additional companies have become sustaining members, bringing the total as of July 25 to 105.

In the list which appears below, it will be noted that the companies represent a wide range of industries, concerned with many diverse types of materials. It can be said of the list as a whole that while there are some fields not represented among the 105 companies there will be found representation from most of the leading materials fields.

Aside from the primary reason which has motivated these companies to subscribe to sustaining membership, namely, financial support of the work to a degree more nearly commensurate with the inherent value of the work to them, there are distinctly tangible advantages to be derived from this type of membership. One of them is that sustaining members receive *all* publications issued by the Society, which in addition to so-called regular publications —Book of Standards, *Proceedings*, Bulletin, Year Book, etc. —include all technical publications, symposiums, etc., a number of which are available only on purchase. They may also procure an extra set of the Book of Standards and extra copies of the Bulletin.

The notes which follow give brief information about sustaining memberships acquired to June 1, 1940; information about other such members will appear in a succeeding Bulletin.

New Sustaining Members

The Duriron Co., Inc., Walter H. Scott, General Sales Manager, Dayton, Ohio

This organization has been affiliated with the Society through a company membership since 1925 and has participated in the work of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys for some 13 years. During most of this time Mr. Scott has served on the main committee and several subcommittees. The company is also a member of Committee A-10 on Iron-Chromium-Nickel and Related Alloys.

A. O. Smith Corp., Charles W. Wheatley, Laboratory Director, Milwaukee, Wis.

Technologists representing this company have been active in various phases of the Society's committee work, the company having been affiliated with the Society since 1919. Mr. Wheatley serves on Committees A-1 on Steel, A-10 on Iron-Chromium-Nickel and Related Alloys, and E-7 on Radiographic Testing. Mr. T. McLean Jasper, who is Director of Research, has been a personal member of the Society for many years and has served on the Committee on Fatigue of Metals. This company is also represented on Committee E-2 on Spectrographic Analysis.

Camden Forge Co., J. H. Higgins, Materials Engineer, Camden, N. J.

Continuously since 1918 this company, a leader in its field, has been affiliated with the Society. For almost 20 years Mr. Higgins has been the representative. He has been active in the work of several committees, including Committees A-1 on Steel and A-2 on Wrought Iron. In the former he heads a special section of Subcommittee VI on Steel Forgings and Billets. For many years Mr. Higgins has been a member of Committee E-4 on Metallography and he also serves on Committee A-10 on

Iron-Chromium-Nickel and Related Alloys. W. D. Kerlin, Secretary and Treasurer of this company, has been a personal member of the Society for 21 years.

Chicago Bridge and Iron Co., George Terry Horton, President, Chicago, Ill.

One of the leading organizations in its field of design and fabrication of tanks and related structures, this company was represented in the Society through a personal membership held by Mr. Horton since 1916 and also a personal membership by E. S. Fraser. The organization has been keenly interested in many phases of our activities involving standardization and research. It is of interest to note that Mr. Horton is President of the American Welding Society.

Caterpillar Tractor Co., C. G. A. Rosen, Assistant Chief Engineer, Peoria, Ill.

While its sustaining membership is the first taken by this organization in its name, a number of its technical men have been personal members, including Paul Weeks, Washington Manager of the branch in Washington, D. C., who has been a member since 1906, and Mark A. Ammon, Metallurgical Engineer, who has been a member since 1927. Mr. Rosen who also was a personal member is active in the work of Committee D-2 on Petroleum Products and Lubricants, serving as a member of the sectional committee on engine deposits of Technical Committee B on Lubricants and is chairman of Technical Committee F on Diesel Fuel Oils.

Marquette Cement Manufacturing Co., D. S. Colburn, Vice-President, Chicago, Ill.

This company has been affiliated with the Society since 1905. Mr. Colburn has been a member of Committee C-1 on Cement for a number of years. J. C. Witt, a personal member, who is Technical Service Manager of the company is affiliated with Committees D-3 on Gaseous Fuels, D-5 on Coal and Coke, and C-9 on Concrete and Concrete Aggregates.

Plaskon Co., Inc., Maurice H. Bigelow, Technical Representative, Toledo, Ohio

Formerly a company member of the Society since 1933, this organization has transferred its membership to the sustaining class with Mr. Bigelow continuing as representative. He has been a member of Committee D-20 on Plastics since its organization in 1937 and he is also a member of Subcommittee II on Molded Insulating Materials of Committee D-9 on Electrical Insulating Materials.

Duke Power Co., D. Nabow, Designing Engineer, Charlotte, N. C.

While not actively participating in phases of the Society's work this company, one of the leading utility operating organizations in the South, has been affiliated with the Society through a company membership since 1922. Mr. Nabow, Designing Engineer, who was the representative of his company's membership before its transfer to the sustaining class, continues as the official representative.

Union Oil Co. of California, Basil Hopper, Assistant Manager of Research and Development, in Charge of Research, Wilmington, Calif.

As would be expected this company, affiliated in a corporate capacity with A.S.T.M. since 1918, has been interested in the work of Committee D-2 on Petroleum Products and Lubricants and has been represented on the committee continuously for some 18 years. It is also a member of Committees D-4 on Road and Paving Materials and D-8 on Bituminous Waterproofing and Roofing Materials. Mr. Hopper is the representative on Committee D-4 while C. C. Moore represents the company on Committee D-2 and serves on several of its subcommittees.

Forstmann Woolen Co., Werner von Bergen, Chief Chemist, Passaic, N. J.

Mr. von Bergen who represents this membership has been personally affiliated with the Society since 1932 and very active in the work of Committee D-13 on Textile Materials, in particular, its Subcommittee A-3 on Wool and Its Products. He is chairman of one of the sections on wool and is active in the work of other groups concerned with yarns, floor coverings, and worsted fabrics. He is a member of D-13's subcommittee on methods and machines and serves as a member of the D-13 Advisory Committee. He is also a member of Committee D-12 on Soaps and Other Detergents, serving on its section on textile soaps.

Apex Smelting Co., George H. Starrmann, Vice-President, Chicago, Ill.

William A. Singer, President of this company, has been a personal member of the Society since 1929, a member of Committee B-7 on Light Metals and Alloys since that time, and of Committee B-6 on Die-Cast Metals and Alloys since 1930. Mr. Starrmann, who also held a personal membership in A.S.T.M., has been active for a number of years in the work of these two committees—at present serving on two subcommittees of each. He is also an active member of Committee E-3 on Chemical Analysis of Metals.

Leeds & Northrup Co., I. Melville Stein, Director of Research, Philadelphia, Pa.

A number of technologists of this company are active in committee work of the Society, the company itself having been a member since 1913. The official representative until 1932 was Mr. Morris E. Leeds, former President of the company, now Chairman of the Board. Dr. J. W. Harsch, Assistant Chief Engineer, has been a member of Committee B-4 on Electrical-Heating, Resistance, and Furnace Alloys for 15 years. Dr. P. H. Dike, Assistant Director of Research, has been active in the work of Committees A-6 on Magnetic Properties and D-9 on Electrical Insulating Materials for upwards of 10 years. The company is also represented on other Society groups, including the committees on metallography, spectrographic analysis, and water for industrial uses.

The Titanium Alloy Manufacturing Co., George F. Comstock, Metallurgist, Niagara Falls, N. Y.

This company held membership in the Society for about 25 years, after which it was represented until it subscribed to the class of sustaining membership, by memberships held personally by its technical executives. With the exception of a brief period, Mr. Comstock has been a personal member of the Society since 1917. This organization is interested in the work of a number of committees, particularly, in the metals field, including the following: Committees A-1 on Steel, A-3 on Cast Iron, A-9 on Ferro-Alloys, A-10 on Iron-Chromium-Nickel and Related Alloys, and E-4 on Metallography. Mr. Comstock is a member of each of these groups.

St. Joseph Lead Co., Irwin H. Cornell, Vice-President and Sales Manager, New York, N. Y.

For over 20 years (since 1919) this company has been a member of the Society and actively interested in committee work, particularly in the field of non-ferrous metals and alloys. Mr. Cornell serves on Committee B-2 on Non-Ferrous Metals and Alloys and three of its subcommittees; also Committee B-6 on Die-Cast Metals and Alloys. Charles R. Ince, Assistant Sales Manager, who has been a personal member for a number of years, also serves on Committee B-6 and three of its subcommittees and is active in the work of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys.

Minnesota Mining and Manufacturing Co., L. A. Hatch, Manager, Roofing Granule Division, St. Paul, Minn.

This company, represented in the Society through a company membership since 1935, is concerned with various phases of work in the field of standardization and research. Mr. Hatch has been a member of Committee D-8 on Bituminous Waterproofing and Roofing Materials for a number of years. The company is also represented on Committee D-11 on Rubber Products.

American Bureau of Shipping, David Arnott, Chief Surveyor, 24 Old Slip, New York, N. Y.

A company member of long standing this organization has been continuously associated with A.S.T.M. since 1906. Mr. Arnott has been a member of Committee A-1 on Steel and its subcommittees for many years. He also serves on Committees A-2 on Wrought Iron and A-5 on Corrosion of Iron and Steel. Recently, J. L. Wilson of this organization was ap-

pointed to membership in Committee C-16 on Thermal Insulating Materials.

Canadian Car and Foundry Co., Ltd., Charles F. Pascoe, Superintendent, Steel Foundry Division, Montreal, P. Q., Canada

This company, formerly the Canadian Steel Foundries, Ltd., dates its company affiliation with the Society since 1926. Mr. Pascoe has been concerned with the work of Committee A-1 on Steel, serving on Subcommittee VIII on Steel Castings. He also is a member of Committee A-10 on Iron-Chromium-Nickel and Related Alloys, having served on this committee since 1929.

The National Cash Register Co., H. M. Williams, Vice-President, Engineering and Research, Dayton, Ohio

While this company has been interested in the Society's work for many years, its affiliation dating from 1917, its committee activities have been confined primarily to the work on die-cast metals and alloys. Mr. Williams has served as a member of this committee for many years. Last year B. C. Morris was designated to represent the company on this committee.

Westinghouse Air Brake Co., C. E. MacFarlane, Chief Chemist, Wilmerding, Pa.

With its participation in Society work as a company member dating from 1909, this company is concerned with several different phases of standardization and research work in the field of materials. Mr. MacFarlane serves on Committee D-2 on Petroleum Products and Lubricants and several of its subcommittees. He also serves on Committee B-6 on Die-Cast Metals and Alloys and is a member of several subcommittees of Committee E-2 on Spectrographic Analysis. Through its representative, J. B. Evans, the company is actively concerned with various phases of the work of Committee D-11 on Rubber Products.

Lebanon Steel Foundry, George F. Landgraf, Chief Metallurgist, Lebanon, Pa.

Twenty-two years ago this central Pennsylvania company became a member of the A.S.T.M. For a number of years T. S. Quinn, Treasurer, has been a personal member, serving on various committees from time to time. Through its technical representatives the company has been represented on Committees A-1 on Steel, A-10 on Iron-Chromium-Nickel and Related Alloys, and E-7 on Radiographic Testing. Mr. Landgraf at present is a member of these groups and certain of their subcommittees.

Sperry Gyroscope Co., Inc., Robert W. Waring, Engineer, Brooklyn, N. Y.

A leader in its field, this organization is actively concerned with numerous Society committees, particularly in the field of non-ferrous metals and alloys. Mr. Waring, who has served as the representative since the company became a member in 1935, is affiliated with Committee B-7 on Light Metals and Alloys and four of its subcommittees; Committee B-2 on Non-Ferrous Metals and Alloys and three of its subcommittees; and B-3 on Corrosion of Non-Ferrous Metals and Alloys and B-5 on Copper and Copper Alloys, serving on two subcommittees of each of these groups. He is also a member of Committee B-6 on Die-Cast Metals and Alloys.

Over One Hundred Standards Referred to Letter Ballot

By action of the Forty-third Annual Meeting, 113 recommendations from the standing committees affecting standards and tentative standards were approved for submission to letter ballot of the Society membership. These recommendations comprise 39 tentative standards proposed for adoption as standards and the adoption as standard of revisions in 74 existing standards.

A complete list of the items to be voted upon appears in the letter ballot being sent in a separate mailing to the members. Detailed information concerning all matters referred to letter ballot is given in the committee reports issued in preprint form to the membership in advance of the meeting. The *Summary of Proceedings* accompanying the letter ballot contains a record of all actions taken at the annual meeting and also gives in full detail any changes in or additions to the standing committee recommendations as preprinted.

The ballot will be canvassed on September 3 at which time all items receiving a favorable vote become effective.

Course in Industrial Statistics

Announcement has been received of a course in industrial statistics, September 4 to 14, to be given at Massachusetts Institute of Technology. This course is intended for workers in industrial plants and scientific laboratories who would like to acquire the rudiments of modern statistical technique as applied to the design and analysis of laboratory experiments and to the control of the quality of industrial products. Further details about the course can be obtained from Prof. G. P. Wadsworth, Department of Mathematics.

Report of Joint Committee on Concrete Published

As announced in the Circular Letter to Members late in May, the final report of the third Joint Committee on Standard Specifications for Concrete and Reinforced Concrete has been published. This report submits recommended practice and standard specifications for these materials. Each member of the Society has had the opportunity to request a copy of the report and special prices are in effect for the report proper, and also for the report plus the supplement of 26 A.S.T.M. specifications and test methods which are incorporated in the report by reference. The 160-page report is in three parts covering recommended practice, standard specifications, and appendices. In the specifications section, the properties of materials are in general covered by reference to A.S.T.M. requirements with some amplification and additions; also given are proportioning requirements and other points covered involve mixing, curing, enforcement of strength requirements, forms and placing, etc.

The report proper in heavy paper cover can be obtained by members at $1 per copy ($1.50 to non-members) and the report plus the 26 A.S.T.M. specifications totaling some 290 pages is available to members at the special price of $1.25 ($2 to non-members). Also available is a special compilation of the A.S.T.M. specifications which is listed at 50 cents per copy to members (75 cents to non-members).

Pagination Error in *Proceedings*

Attention is called to an error in pagination in the 1939 *Proceedings*. In printing, pages 862 and 864 have been interchanged; page 862 has been designated 864, page 864 being designated 862. It is suggested that each member make suitable notation of this in his copy of the *Proceedings*.

New and Revised Tentative Standards Approved; Withdrawals Listed for Members' Convenience

The Society accepted at the annual meeting 75 new tentative standards and revisions of 67 existing tentative specifications and methods of test. Of the new tentative standards 12 are revisions of existing standards—these are indicated in the following list. Ten of the 67 revised tentative specifications and test methods represent extensive modifications. The titles of these are included below (marked with an asterisk) with the list of those issued by the Society for the first time. Standing committees responsible for the various items are indicated in italics. The number of new tentative standards is the largest that has ever been approved at an annual meeting.

New and Revised Tentative Standards

Ferrous Metals

Specifications for:
- Factory-Made Wrought Carbon-Steel and Carbon-Molybdenum-Steel Welding Fittings (A 234 - 40 T). *Committee A-1.*
- Carbon-Steel Forgings for General Industrial Use (A 235 - 40 T). *Committee A-1.*
- Carbon-Steel Forgings for Locomotives and Cars (A 236 - 40 T). *Committee A-1.*
- Alloy-Steel Forgings for General Industrial Use (A 237 - 40 T). *Committee A-1.*
- Alloy-Steel Forgings for Locomotives and Cars (A 238 - 40 T). *Committee A-1.*

Methods of:
- Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles (A 239 - 40 T). *Committee A-5.*

Non-Ferrous Metals

Specifications for:
- Pig Lead (B 29 - 40 T) (revision of standard). *Committee B-2.*
- Cartridge Brass Sheet, Strip, and Disks (B 19 - 40 T) (revision of standard). *Committee B-5.*
- Naval Brass Rods (B 21 - 40 T) (revision of standard). *Committee B-5.*
- Seamless Copper Tubes (B 75 - 40 T) (revision of standard). *Committee B-5.*
- Cartridge Brass Cartridge Case Cups (B 129 - 40 T). *Committee B-5.*
- Gilding Metal Sheet and Strip (B 130 - 40 T). *Committee B-5.*
- Gilding Metal Bullet Jacket Cups (B 131 - 40 T). *Committee B-5.*
- Leaded High-Strength Yellow Brass (Manganese Bronze) Sand Castings (B 132 - 40 T). *Committee B-5.*
- Copper Rods, Bars, and Shapes (B 133 - 40 T). *Committee B-5.*
- Brass Wire (B 134 - 40 T). *Committee B-5.*
- Miscellaneous Brass Tubes (B 135 - 40 T). *Committee B-5.*
- *Beryllium-Copper Alloy Bars, Rods, Sheet, Strip, and Wire (B 120 - 40 T). *Committee B-5.*

Methods of:
- Testing Sleeves and Tubing for Radio Tube Cathodes (B 128 - 40 T). *Committee B-4.*
- Test for Sealing of Anodically Coated Aluminum (B 136 - 40 T). *Committee B-7.*
- Test for Weight of Coating on Anodically Coated Aluminum (B 137 - 40 T). *Committee B-7.*

Methods of Testing

Specifications for:
- *A.S.T.M Thermometers (E 1 - 40 T), requirements for new turpentine distillation thermometer. *Committee E-1.*

Methods of:
- Tension Testing of Metallic Materials (E 8 - 40 T) (revision of standard). *Committee E-1.*

Recommended Practices for:
- Designation of Numerical Requirements in Standards (E 29 - 40 T). *Committee E-1.*

Definitions of:
- *Terms Relating to Rheological Properties of Matter (E 24 - 40 T). *Committee E-1.*

Cement

Specifications for:
- Portland Cement (C 150 - 40 T). *Committee C-1.*

Methods of:
- Test for Autoclave Expansion of Portland Cement (C 151 - 40 T). *Committee C-1.*
- *Chemical Analysis of Portland Cement (C 114 - 40 T). *Committee C-1.*

Fire Tests

Methods of:
- Fire Tests of Door Assemblies (C 152 - 40 T). *Committee C-5.*

Refractories

Specifications for:
- Refractories for Malleable Furnaces with Removable Bungs, and for Annealing Ovens (C 63 - 40 T) (revision of standard). *Committee C-8.*
- Refractories for Heavy Duty Stationary Boiler Service (C 64 - 40 T) (revision of standard). *Committee C-8.*
- Refractories for Moderate Duty Stationary Boiler Service (C 153 - 40 T) (revision of standard). *Committee C-8.*
- Refractories for Incinerators (C 106 - 40 T) (revision of standard). *Committee C-8.*
- Classification of Insulating Fire Brick (C 155 - 40 T). *Committee C-8.*

Methods of:
- Test for Warpage of Refractory Brick and Tile (C 154 - 40 T). *Committee C-8.*

Concrete and Concrete Aggregates

Methods of:
- Test for Efficiency of Materials for Curing Concrete (C 156 - 40 T). *Committee C-9.*
- Test for Volume Changes of Cement Mortar and Concrete (C 157 - 40 T). *Committee C-9.*

Pigments and Paint

Specifications for:
- Ultramarine Blue (D 262 - 40 T) (revision of standard). *Committee D-1.*
- Titanated Lithopone (D 477 - 40 T) (revision of standard). *Committee D-1.*
- Carbon Black (D 561 - 40 T). *Committee D-1.*

Methods of:
- Test for Consistency of Enamel Type Paints (D 562 - 40 T). *Committee D-1.*
- Test for Phthalic Anhydride Content of Alkyd Resin Solutions (D 563 - 40 T). *Committee D-1.*
- Testing Liquid Driers (D 564 - 40 T). *Committee D-1.*

Definitions of:
- Terms Relating to Paint, Varnish, Lacquer, and Related Products (D 16 - 40 T) (revision of standard). *Committee D-1.*

Petroleum Products and Lubricants

Methods of:
- Test for Carbonizable Substances in White Mineral Oil (Liquid Petrolatum) (D 565 - 40 T). *Committee D-2.*
- Test for Dropping Point of Lubricating Grease (D 566 - 40 T). *Committee D-2.*
- Calculating Viscosity Index (D 567 - 40 T). *Committee D-2.*
- *Test for Carbon Residue of Petroleum Products (Ramsbottom Carbon Residue). (D 524 - 40 T). *Committee D-2.*

Road and Paving Materials

Specifications for:
- Materials for Stabilized Base Course (D 556 - 40 T). *Committee D-4.*
- Materials for Stabilized Surface Course (D 557 - 40 T). *Committee D-4.*

Coal and Coke

Method of:
- *Sampling Coals Classed According to Ash Content (D 492 - 40 T). *Committee D-5.*

Paper

Methods of:
- Sampling Paper and Paper Products (D 585 - 40 T). *Committee D-6.*
- Test for Ash Content of Paper and Paper Products (D 586 - 40 T). *Committee D-6.*
- Test for Casein in Paper (Qualitative) (D 587 - 40 T). *Committee D-6.*
- Test for Alpha-, Beta-, and Gamma-Cellulose in Paper (D 588 - 40 T). *Committee D-6.*
- Test for Opacity of Paper and Paper Products (D 589 - 40 T). *Committee D-6.*
- Test for Paraffin Content of Waxed Paper (D 590 - 40 T). *Committee D-6.*
- Test for Starch in Paper (D 591 - 40 T). *Committee D-6.*

Electrical Insulating Materials

Specifications for:
*Flexible Varnished Tubing Used in Electrical Insulation (D 372 – 40 T). *Committee D-9.*

Rubber

Specifications for:
Insulated Wire and Cable: Ozone-Resistant Type Insulation (D 574 – 40 T). *Committee D-11.*

Methods of:
Testing Automotive Hydraulic Brake Hose (D 571 – 40 T). *Committee D-11.*
Test for Compression-Deflection Characteristics of Vulcanized Rubber (D 575 – 40 T). *Committee D-11.*

Soaps and Detergents

Specifications for:
Olive Oil Solid Soap (Type A, Pure; Type B, Blended) (D 592 – 40 T). *Committee D-12.*
Salt-Water Soap (D 593 – 40 T). *Committee D-12.*
Sodium Sesquisilicate (D 594 – 40 T). *Committee D-12.*
Tetrasodium Pyrophosphate (Anhydrous) (D 595 – 40 T). *Committee D-12.*
*Palm Oil Solid Soap (Type A, Pure; Type B, Blended) (D 535 – 40 T). *Committee D-12.*

Definitions of:
*Terms Relating to Soaps and Other Detergents (D 459 – 40 T). *Committee D-12.*

Textile Materials

Specifications for:
All Wool, All Cotton, and Wool and Cotton Blanketing (Household) (D 576 – 40 T). *Committee D-13.*

Methods of:
Testing Woven Asbestos Cloth (D 577 – 40 T). *Committee D-13.*
Testing and Tolerances for Glass Yarn (D 578 – 40 T). *Committee D-13.*
Testing and Tolerances for Woven Glass Fabrics (D 579 – 40 T). *Committee D-13.*
Testing and Tolerances for Woven Glass Tapes (D 580 – 40 T). *Committee D-13.*
Testing and Tolerances for Woven Glass Tubular Sleeving and Braids (D 581 – 40 T). *Committee D-13.*
Test for Resistance of Fabrics and Yarns to Moths (D 582 – 40 T). *Committee D-13.*
Test for Resistance of Fabrics to Water (D 583 – 40 T). *Committee D-13.*
Test for Shrinkage of Grease Wool (Laboratory Scale Operations) (D 584 – 40 T). *Committees D-13.*

Definitions of:
*Terms Relating to Textile Materials (D 123 – 40 T). *Committee D-13.*

Soils

Methods of:
Test for Moisture-Density Relations of Soil-Cement Mixtures (D 558 – 40 T). *Committee D-18.*
Wetting-and-Drying Test of Compacted Soil-Cement Mixtures (D 559 – 40 T). *Committee D-18.*
Freezing-and-Thawing Test of Compacted Soil-Cement Mixtures (D 560 – 40 T). *Committee D-18.*

Water

Methods of:
Reporting Results of Analysis of Industrial Waters (D 596 – 40 T). *Committee D-19.*

Plastics

Methods of:
Test for Flammability of Plastics (D 568 – 40 T). *Committee D-20.*
Test for Measuring Flow Temperatures of Thermoplastic Molding Materials (D 569 – 40 T). *Committee D-20.*
Test for Water Absorption of Plastics (D 570 – 40 T). *Committee D-20.*

Standards and Tentative Standards Withdrawn and Replaced

Actions at the annual meeting based on the various standing committee recommendations as detailed in the preprinted reports resulted in the withdrawal of a number of standards and tentative standards.

In reviewing the accompanying list, it should be kept definitely in mind that in a great many cases the items withdrawn have been replaced by other specifications or tests accepted at the 1940 meeting (these are listed above under New and Revised Tentative Standards) or in a few cases by items issued previous to this year.

Full details of all of the actions affecting the standards and tentative standards are given in the Summary of Proceedings which is being sent to each member in a separate mailing.

Standard Specifications for:
Carbon-Steel and Alloy-Steel Forgings (A 18 – 30), replaced by new Tentative Specifications.
Normalized Quenched-and-Tempered Alloy-Steel Forgings (A 63 – 39), replaced by new Tentative Specifications.
Pig Lead (B 29 – 35), replaced by new Tentative Specifications.
Cartridge Brass (B 19 – 29), replaced by new Tentative Specifications.
Cartridge Brass Disks (B 20 – 29), combined with Tentative Specifications B 19 – 40 T.
Naval Brass Rods for Structural Purposes (B 21 – 29), replaced by new Tentative Specifications.
Seamless Copper Tubes (B 75 – 30), replaced by new Tentative Specifications.
Fireclay Brick for Malleable Furnaces with Removable Bungs and for Annealing Ovens (C 63 – 39), replaced by new Tentative Specifications.
Fireclay Brick for Stationary Boiler Service (C 64 – 39), replaced by new Tentative Specifications.
Refractories for Construction of Incinerators (C 106 – 39), replaced by new Tentative Specifications.
Ultramarine Blue (D 262 – 28), replaced by new Tentative Specifications.

Tentative Specifications for:
Carbon-Steel Forgings (A 18 – 39 T), replaced by new Tentative Specifications.
Normalized and Tempered Alloy-Steel Forgings for Locomotives (A 133 – 33 T), replaced by new Tentative Specifications.
Leaded-Nickel-Brass and Leaded-Nickel-Bronze (Nickel-Silver) Alloys in Ingot Form for Sand Castings (B 123 – 39 T).

Standard Methods of:
Tension Testing of Metallic Materials (E 8 – 36), replaced by new Tentative Methods.

Tentative Methods of:
Test for Abrasion of Gravel [illegible]e of the Deval Machine (D 289 – 37 T).

Standard Definitions of:
Terms Relating to Paint (D 16 – 24), replaced by new Tentative Definitions.
Terms Relating to Soaps and Other Detergents (D 459 – 39), replaced by new Tentative Definitions.

Tentative Definitions of:
Terms Relating to Clay Sewer Pipe (C 8 –35 T).

Patents on Conditioning Water Listed

One of the activities of the Joint Research Committee on Boiler Feedwater Studies has been the work of a subcommittee engaged in listing important patents which have been issued, either in this country or in foreign countries, for processes or equipment relating to the conditioning of boiler feedwater or allied problems.

This group has issued four progress reports, but there is only a limited supply of the first three reports. However, the fourth progress report lists the pertinent patents cited in *Chemical Abstracts* from November, 1938, through November, 1939, and by the *Patent Office Gazette* from October, 1938, through October, 1939. This report has been reproduced and is now offered for sale through the A.S.M.E. Technical Committee's Department at the A.S.M.E. Headquarters, 29 West 39th St., New York, N. Y., at a cost of twenty-five cents per copy.

Many members of A.S.T.M. are concerned with boiler feedwater studies and the Society is one of the joint sponsors of the committee.

Standardization Activities Under Way

Committees Have Many Specifications and Tests in Process

Many of the standing committees as a result of actions taken at the annual meeting expect to submit proposed specifications or tests or revisions at the next meeting of Committee E-10 on Standards to be held in August. In addition to these items many committees have standardization programs under way which will undoubtedly result in many proposed new tentative specifications, to be offered at the 1941 A.S.T.M. Annual Meeting.

In the following paragraphs there is given information on some of the standardization activities under way, much of which supplements reviews of committee activities appearing in 1940 reports. The material is grouped according to the various committee classifications for ease of reference.

Ferrous Metals

While for the first time in a number of years Committee A-1 on Steel will not have items to be referred to Committee E-10, a number of specifications are in course of development. It is expected drafts of requirements for so-called high-strength structural steels will be set up. Weldability is one of the factors which is being considered in connection with the requirements and because of the many difficulties involved agreeing on specification requirements will not be easy. Standardized requirements for ring or disk type forgings are to be considered and there will be a continuation of activity in the field of piping and tubular materials. Whether a new grade of seamless carbon molybdenum steel should be added in the boiler tube specifications to take care of tubing which is to be forge-welded and how to cover the question of copper molybdenum iron boiler tubes are two questions which are being considered. Whether or not separate specification requirements are necessary to cover material for header tubes is being studied. Further study will be made of specifications covering welded alloy steel boiler tubes and welded carbon-molybdenum-steel boiler tubes.

In the field of wrought iron, a special section of Committee A-2 has been appointed to develop proposed specification requirements for finished staybolts, ground bars, and similar materials.

New specifications for pig iron to replace the standard specifications for foundry pig iron (A 43 – 24) have been drafted and are being considered by Committee A-3.

Among the several standardization matters under way in Committee A-5 on Corrosion of Iron and Steel are the development of revisions in the specifications for zinc-coated iron or steel chain-link fence fabric galvanized after weaving (A 117 – 33) and also drafting of requirements for this material galvanized before weaving. The committee expects to proceed with its work in developing specifications to cover zinc coating not only on hardware and fastenings (present specifications to be revised), but on related products and the inclusion of a more than one weight-of-coating class. Further study will be made of test methods for electrodeposited coatings on steel.

Since no standard method has been issued for the measurement of permeability of nonmagnetic steel materials, Committee A-6 on Magnetic Properties through its subcommittee on direct current test methods will undertake to develop suggested procedures, studying the various methods now in use. The work on alternating current methods of measuring core losses and the permeability on small Epstein specimens has been established and specimens are now being tested by a number of laboratories to determine the reproducibility of the results.

Among the projects under way in Committee A-10 on Iron-Chromium-Nickel and Related Alloys are the drafting of a corrosion testing procedure in boiling liquids and the development of specifications for tubular material. The committee expects to submit to Committee E-10 a new tentative standard giving requirements for corrosion-resisting sheets for fusion-welded vessels.

Non-Ferrous Metals

Committee B-1 on Copper and Copper-Alloy Wires for Electrical Conductors plans either to submit to Committee E-10 on Standards during the year its specifications for bare rope-lay-stranded and bunch-stranded soft copper cables which were withheld by the committee and not submitted to the Society at the meeting as had been planned, or to have them published as information in the ASTM Bulletin. A similar procedure will be followed in connection with the twist test in the specifications for hot-rolled copper rods. Specification requirements for lead and lead-alloy coated wires are the subject of a questionnaire, and the desirability of specifications for tinned-coated hard-drawn and medium-hard-drawn copper wire is being investigated. Another project involves the study of dimensional tolerances and the elimination of any possible inconsistencies which may be uncovered.

After extensive work, Committee B-2 on Non-Ferrous Metals and Alloys, through its Subcommittee III on White Metal Alloys, plans to submit to Committee E-10 in August revisions of the Standard Specifications for Solder Metal (B 32 – 21) providing revised requirements for soft solder.

Standards for electrodeposited coatings of nickel and chromium on copper and copper alloys and on zinc and zinc alloys have been considered intensively by Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys in cooperation with Committee B-6 on Die-Cast Metals and Alloys and after submitting the latest proposals on questions of sampling and spot test for chromium about which there was some difference of opinion, it is expected the requirements may be submitted to Committee E-10 during the year.

In its work on life tests, Committee B-4 on Electrical-Heating, -Resistance, and -Furnace Alloys, is continuing the study of a test for electric-furnace resistors in which the temperature of test would be readjusted daily to the initial temperature. Work is to be undertaken on testing procedures for electrical contact metals, the program

which has been developed involving contacts suited for currents in the range of 0.1 to 50 amperes. A test which is in use for resilience of strip is being considered by the committee for possible standardization. In its work on metallic materials for radio tubes and incandescent lamps, the committee is developing tests for stiffness, brittleness, and hot tensile strength of tungsten wire and three laboratories are cooperating on work on high-temperature tests of filament materials for radio tubes.

Outstanding among the recommendations to be made by Committee B-5 on Copper and Copper Alloys are revised specifications for copper-base alloys in ingot form for sand castings, the requirements covering some 25 alloys. The specifications which are of interest in connection with the national preparedness program will undoubtedly be referred to Committee E-10 at its August meeting and if approved will replace the existing standard B 30. New specifications will be prepared covering phosphor bronze spring wire. Also out for letter ballot approval in the committee are revisions of the Specifications for Seamless Copper Tubes (B 75 – 30). A series of tests is under way to promote standardization of the mercurous nitrate test for copper-base alloys and the pin or expansion tests specified in various tube specifications.

One of the projects under way in Committee B-7 on Light Metals and Alloys is the preparation of specifications for protective coatings for magnesium-base alloy sand castings, forgings, ingot for remelting, bars, rods and shapes, and sheet; also, the development of procedures for testing anodic coatings involving abrasion resistance, thickness, scratch resistance, and reflectivity.

Ceramics, Glass, Concrete, and Masonry Materials

Revisions of the standard specifications for clay sewer pipe (C 13) are expected to be submitted to Committee E-10 for approval as the result of work of Committee C-4 on Clay Pipe. Committee C-13 on Concrete Pipe is submitting also to Committee E-10 a number of tentative changes in the specifications for concrete sewer pipe (C 14), reinforced-concrete sewer pipe (C 75), and reinforced-concrete culvert pipe (C 76) as the result of a favorable letter ballot vote. While there is considerable rearrangement and changes of an editorial nature, some substance changes are also being recommended. These proposals will not affect the specifications since they are standard and the revisions are proposed as tentative.

Committee C-14 on Glass and Glass Products has developed changes in three tentative methods of test—namely, hydrostatic pressure test (C 147), polariscopic examination (C 148), and thermal shock test (C 149) on glass containers. It also expects to propose to Committee E-10 the approval of a new tentative method of measuring the modulus of rupture of glass test pieces. This matter is being referred at the present time to letter ballot of Committee C-14.

In committee C-8 on refractories, a section has been studying the revised design for the back-up insulation used during the preheating period of the panels in the panel-spalling test. As a result of its study, this section expects to offer some changes at the fall meeting of Committee C-8. The committee also has prepared certain recommendations in connection with the uniformity of pyrometric test cones used in the standard method of test for pyrometric cone equivalent of refractory materials (C 24). The subcommittee on heat transfer is continuing its work on thermal conductivity of block insulation.

In the specifications for paving brick (C 7), Committee C-15 on Manufactured Masonry Units will recommend certain changes in the table of types and sizes and of the dimensions of the lugs, the proposals to be referred to Committee E-10 in August for approval. Revisions will also be proposed as tentative in the methods of sampling and testing brick (C 67) to cover tests for recessed brick and modifications of the paragraph on speed of testing in connection with the use of hydraulically operated testing machines. The committee expects to prepare during the year a new standard for structural clay tile which is manufactured with unusually low tolerances for variations in dimensions and surface imperfections. It will also propose a clarified statement to be added on the finish of unscored tile in specifications for structural clay load-bearing wall tile (C 34) and for structural clay non-load-bearing tile (C 56).

The active program of Committee C-9 on Concrete and Concrete Aggregates includes the completion of four new methods of test which will probably be submitted to the Society during 1940, covering the following: Sampling of wet concrete, making beam specimens in the field, measuring cores drilled from concrete structures, and determining water gain. The committee also plans to submit specifications for waterproofed paper curing agents.

Among the existing standards in which revisions may be proposed, the following are indicated, covering making of concrete specimens in the field (C 31), compressive strength of concrete (C 39), organic impurities in sand (C 40), structural strength of fine aggregate using constant water-cement ratio mortar (C 87) and lightweight aggregates for concrete (C 130). The following items will be studied during the year: tests for soundness of concrete and mortar by freezing and thawing; tests for uniformity of concrete mixes; and tests to determine the percentage of soft particles in aggregate.

Paint, Paper, Rubber, Petroleum

One activity of Committee D-1 on Paint, Varnish, Lacquer, and Related Products involves the establishment of suitable definitions for a number of terms such as putty, japan, lacquer, synthetic resins, etc. The work on accelerated tests for protective coatings has made progress in the various groups working on house paints, oleoresinous type enamels, metal protective paints, and others. Proposed tests for determining the color of orange shellac have been developed and are published in this Bulletin.

At the meeting of Committee E-10, Committee D-4 on Road and Paving Materials will submit new tentative specifications for cut-back asphalts which cover six grades of rapid curing and six grades of medium grade curing material. Revisions in the methods of sampling stone, slag, gravel, sand, and stone block for use as highway materials, including some material survey methods (D 75), will be submitted also. Based on intensive work during the year there are nearing completion proposed methods of test for modified miscibility and for dehydration of emulsified asphalts, and for portland cement mixing of emulsified asphalts. Also nearing completion are proposed specifications for slow setting emulsified asphalt for

fine aggregate mixes and standard requirements for traffic paint.

Committee D-6 on Paper and Paper Products will continue its intensive study on various tests which have been approved by the Technical Association of the Pulp and Paper Industry involving methods of determining basis weight, moisture, tearing strength, saturation properties, water resistance, bursting strength, thickness, sampling, folding endurance, and gloss. It is also working on testing procedures for conditioning, determining tensile strength, and measuring absorption, porosity, stiffness, and curl.

The rubber committee's technical Committee A on Automotive Rubber which functions as a joint committee of the Society of Automotive Engineers and A.S.T.M. is developing test methods for determining the probable life of automotive radiator coolant hose, which is a problem of great concern to automotive and rubber manufacturers. Among other items which Committee D-11 expects to refer to the Society in the near future is a new tentative test covering the so-called T-50 test for the state of cure of rubber; a test method for tear resistance; and two other methods covering accelerated weather exposure by using artificial light and for the calibration of the intensity of light sources. A number of revisions in existing standards have also been developed.

In the field of petroleum products and lubricants, Committee D-2 is considering a modified grease worker for use in determining the worked consistency of greases; also, the practicability of calibrating viscosimeters by comparison with a master viscosimeter rather than by use of reference oil standards is to be investigated. Photoelectric methods for color measurement will be considered and a revised method for determining sulfur in petroleum oils by the lamp method is being developed.

The method for determining aniline point published as information only in the current report will be further developed and probably recommended for acceptance as a tentative standard during the year. Other important problems being studied in the committee involve relationship between data on carbon residue by the Conradson (D 189) and Ramsbottom (D 524) methods. Cooperative work on gum stability tests and study of service problems on turbine oils by new Technical Committee C will continue actively.

Soaps, Textiles, Plastics

Committee D-12 on Soaps and Other Detergents will continue its active program. Some of the projects involve new methods of test for determining carbon dioxide and orthophosphates in soaps, methods of analysis of tetrasodium pyrophosphates, sodium orthosilicate, sulfonated oils, and dry cleaning materials. New specification requirements are being studied for liquid soaps, low titre soaps, red oil soaps, and sodium orthosilicate. Proposed specifications for grit cake soap and detergent soap powder were published as information and comment in the committee's 1940 report. The committee will also continue its study of washing tests on standard soiled fabrics with various sulfated and sulfonated detergents, in order to learn whether performance tests would be satisfactory; the investigations of metal cleaners by means of performance tests will also be continued.

Reference has been made to the extensive report submitted by Committee D-13 on Textile Materials including nine new tentative standards. The committee continues its standardization and research program through its subcommittees on cotton, rayon, wool, asbestos, household and garment fabrics, glass fiber, etc., each of these groups having from one to a half dozen important projects under way so that it is not feasible to list all of them in this article. The section on cotton is studying polarized light methods for maturity and photoelectric methods for length of fibers, and studies of tolerances for cotton yarn numbers are under way in another group. Another problem involves moisture regain of heavy woven fabrics under standard conditions; also, investigation of jaw breaks in testing heavy material.

In the work on rayon, the development of a method for determining the commercial weight of rayon yarn is under way, as is also a test for determining resiliency of rayon staple fiber. Standardization work in the field of wool involves length specifications for wool top, and a method of tension testing of wool top and woolen and worsted roving is being developed Soiling and crushing tests and a method of rating color fastness are problems in the field of pile floor covering. There are studies under way on asbestos and also on bast and leaf fibers.

The interesting work of the subcommittee on household and garment fabrics involves the preparation of specifications for corduroy, dish toweling, and upholstery fabrics, and the development of a method of testing blanketing for heat transmission.

Standardization work under way in Committee D-20 on Plastics involves strength properties, particularly compression, tension, and impact testing; test for deformation under load, and tests for mar, scratch, wear, and abrasion resistance of plastics. The subcommittee on thermal properties intends to study and develop tests for heat and fire-resistance of plastics, as well as a method of test for flow temperatures of thermosetting materials. A study of haze, reflection factors, polarization, surface irregularities, and surface brightness will be carried on by the subcommittee on optical properties. A test method for surface irregularities of transparent organic plastics will be formulated, as well as a glossary of optical terms for plastics. The subcommittee on permanence properties will carry on a study of the resistance of plastics to heat, light, and moisture and the effects on other characteristics.

Metallography, Spectrographic Analysis

Two important new projects are to be undertaken by Committee E-4 on Metallography—one, the establishment of standards for ferrite grain size, the other, methods for the determination of inclusions in steel. Both projects are of significant commercial importance and are being undertaken because of the expressed desire for them on the part of several members. Both represent work in fields where there is a marked lack of agreement between various laboratories and no universally accepted laboratory methods. Successful completion of the projects will provide useful standard methods for the steel makers and users. It is recognized that the establishment of standard methods for measuring and rating inclusions is an especially difficult problem and that several years' effort may be required to complete the work.

Committee E-2 on Spectrographic Analysis which has been so active in promoting symposiums and technical discussions at Society meetings has outlined two phases of work: One, the compilation of a list of apparatus and equipment essential to a laboratory doing work on the emission spectrography of metals. This will provide for those who are concerned with the subject, other than professional spectrographers, an impartial statement of what is required to equip a spectrographic laboratory. It is planned that the list will give the function of each instrument and the necessity for it. In the work on fundamental methods and technique, it has been proposed that there be developed at least in outline form two methods—one using internal standards and one which does not use them. One purpose of these would be to give information to those who are not experts in the field, and it was thought that each method would include discussion of its advantages and disadvantages.

Test Proposed for Color of Orange Shellac

In its report submitted to Committee D-1 on Paint, Varnish, Lacquer, and Related Products at the April 12 meeting, Subcommittee XIII on Shellac headed by Dr. William H. Gardner, Polytechnic Inst. of Brooklyn, reported that it had been actively engaged in developing through a round-robin series of tests a suitable method for the determination of color of orange shellac in terms of numerical values. Three laboratories had reported complete series of results on the color of various types of orange shellac and had obtained excellent agreement. The results of other series of tests were expected to be received.

Based on this work the subcommittee drafted what in the general consensus of the members is believed to be a suitable method for the determination of color of shellac. In order to obtain further suggestions and comments before this method is referred to Committee D-1 and in turn to the Society for acceptance as a tentative standard it was recommended that the method be published in the ASTM Bulletin. One of the basic reasons for this procedure is that expressing color of orange shellac in numerical values is a new departure for the committee and the group would like comments from all who are interested.

PROPOSED METHOD OF TEST FOR COLOR OF ORANGE SHELLAC[1]

This is a proposed method and is published as information only. Comments are solicited and should be addressed to the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

Apparatus

1. The apparatus shall consist of the following:

(a) *Funnel.*—A No. 1 Büchner funnel of Coors porcelain, 5.6 cm. in inside diameter.

(b) *Filter Trap.*—Any type of filter trap which permits easy regulation of pressure.

(c) *Standard Colorimetric Tubes.*—Standard colorimetric tubes, 2 cm. in diameter and of 50-ml. capacity.

(d) *Standard Light Source.*—A standard light source, which may be set up by mounting a 100-w. Mazda blue lamp in the back of a 10-in. square wooden box with the inside painted white. The front opening of the box may be covered with a fine grade of white opaque paper or a ground glass plate. This set up provides a standard light source for color comparison.

Reagents

2. (a) *95 Per Cent Alcohol.*—Specially denatured 190 proof alcohol; either formula No. 1 or formula No. 30 of the U. S. Internal Revenue Bureau.

(b) *Filter Aid.*—Any high-grade analytical filter cel for rapid flow.

(c) *Ferric Sulfate.*—Any hydrated powdered analyzed reagent.

(d) *Standard Sodium Hydroxide Solution.*—Dissolve 40 g. of pure NaOH in 500 ml. of distilled water and dilute to 1 liter in a volumetric flask. Standardize against the correct weight of pure oxalic acid dihydrate. The solution should have a strength of 1 N.

(e) *Standard Sodium Thiosulfate Solution.*—Dissolve pure sodium thiosulfate in distilled water that has been previously boiled to free it from carbon dioxide, in such proportion that 24.83 g. of crystallized sodium thiosulfate will be present in 1 liter of the solution. It is best to let this solution stand about 2 weeks before standardizing. Standardize with pure resublimed iodine or potassium bi-iodate. This solution will be approximately 0.1 *N.* Preserve in a brown stock bottle with a guard tube filled with soda-lime.

(f) *Starch Solution.*—Dissolve 0.2 g. of starch (potato starch) in 100 ml. of boiling water, cool, and bottle.

(g) *Potassium Iodide.*—Iodate-free crystal.

(h) *Nickel Sulfate.*—Analytical reagent grade, $NiSO_4 \cdot 6H_2O$.

Preparation of Color Standards

3. (a) *Stock Solutions.*—Dissolve 400 g. of $Fe_2(SO_4)_3(H_2O)_x$ (Baker's analyzed powdered reagent) in about 600 ml. of water by heating to boiling while stirring constantly. After complete solution cool to room temperature and dilute to 1 liter in a volumetric flask. Standardize this stock solution by titrating with iodine in the following manner: Dissolve 20 g. of potassium iodide in 30 ml. of water and add 5 ml. of the stock solution. Allow to stand for 5 min. and titrate with 0.1 *N* sodium thiosulfate in the usual manner. Adjust the stock solution to 0.725 ± 0.025 *M* $Fe_2(SO_4)_3$. (Note 1.)

Note 1.—The amount of coordinated water in ferric sulfate may vary, and has to be taken into account in weighing out the required amount of ferric salt. It is usually about 6 mols per mol of ferric sulfate for the powdered analyzed reagent.

Dissolve 50 g. of $NiSO_4 \cdot 6H_2O$ in about 300 ml. of water. After complete solution, dilute to 500 ml. in a volumetric flask.

[1] This proposed method is under the jurisdiction of the A.S.T.M. Committee D-1 on Paint, Varnish, Lacquer, and Related Products.

(*b*) *Reference Standard for All Grades.*[2]—Transfer exactly 20 ml. of the stock ferric sulfate solution (Paragraph (*a*)) to a 100-ml. volumetric flask. Add 11.5 ml. of the 1.0 *N* aqueous NaOH solution from a burette, and shake until all the precipitate formed has dissolved. Then, add 10 ml. of the stock nickel sulfate solution and dilute to 100 ml. with distilled water.

Procedure

4. (*a*) Transfer exactly 5 g. of the sample to a clean 4-oz. wide-mouth bottle and add exactly 50 ml. of alcohol. Shake until the solution is complete and then cool to 10 C. Place a 5.5-cm. Whatman No. 5 filter paper or its equivalent in the Büchner funnel which has been mounted in the neck of a 2-l. suction flask with a rubber stopper. Pour evenly upon the filter paper a 1-g. suspension of filter aid in 50 ml. of alcohol, and suck completely dry with a partial vacuum, using a water suction pump. Remove the funnel, and add about 400 ml. of alcohol to the flask. Insert an 8-in. test tube into the suction flask, supporting, if necessary, with filter paper, so that the tip of the Büchner funnel when inserted in the neck of the flask will come well within the open test tube.

(*b*) Insert the funnel in the flask, and add 1 g. of filter aid to the cold varnish and stir thoroughly. Transfer completely to the Büchner funnel and filter at the rate of two drops per second by means of a carefully regulated vacuum. This may be conveniently done by the use of a water pump to which has been attached a trap carrying a stopcock to admit air. Slowly increase the amount of vacuum toward the end of the filtration in order to maintain a constant filtration rate until the filtration is practically complete, and then suck dry. The final volume in the test tube should be 49 to 50 ml. If it is less than 48 ml., repeat the procedure. (Note 2.)

NOTE 2.—The method used in preparing the clear varnishes for comparison is very important. A slight loss in alcohol will materially affect the color of varnish when diluted for comparison. Alcohol is placed in the flask to avoid undue evaporation of the solution during filtration. The rate of filtration is an important factor.

(*c*) Transfer 10 ml. of filtered solution to a long colorimetric tube, and compare with 10 ml. of the standard color solution, by viewing the tubes transversely in front of the standard light source. Dilute the shellac solution with alcohol until it matches the reference standard color. Report the volume in milliliters of the diluted solution which is taken as the color number of the sample. The color of the filtered solution shall be determined the same day upon which the samples are dissolved. (Note 3.)

NOTE 3.—Most filtered solutions of shellac that has been ground for analysis will darken appreciably in color if allowed to stand for periods longer than 12 hr.

[2] This standard color solution was designed to match the No. 5 iodine color standard of the Angelo color method which has been used by various laboratories for obtaining numerical color values for lacs. It is closer in hue to most lacs than the iodine solution and hence easier to match.

Vols. 1 and 2—Physical Constants of Hydrocarbons

ABOUT ONE year ago, the first of the four projected volumes of Physical Constants of Hydrocarbons was presented as an American Chemical Society monograph. Recently, the second volume of this series has appeared. Gustav Egloff is preparing the books, which are published by the Reinhold Publishing Corp., 330 W. 42nd St., New York City.

The volumes reviewed, with the exception of the introduction dealing with such subjects as nomenclature, methods of evaluation of physical constants, and similar necessary remarks, are primarily reference tables assigning the more important physical constants to compounds of recognized structural conformation. This work appears to be an authoritative and carefully compiled series of references covering several thousand hydrocarbons.

The first volume is devoted to the aliphatic hydrocarbons. The second volume is concerned with non-benzenoid hydrocarbons which fall into cyclic classifications; that is, those containing one or more saturated or unsaturated rings.

This work employs the Geneva system of nomenclature and devotes considerable space in the introduction to a discussion of that system which is very useful. The hydrocarbons are classified generally by the method utilized by Beilstein. However, the system has been modified so that all compounds falling into a general group are classified together, and the classification according to the number of carbon atoms repeats with each group. For example, the first portion of Vol. 1, dealing with paraffins, begins with methane, CH_4, and ends with $C_{94}H_{190}$. This is followed by the olefin series, beginning with ethene, C_2H_4. The same arrangement is followed in Vol. 2, which begins with cyclopropane, C_3H_6.

In the case of the majority of the hydrocarbons listed, the boiling point and the melting point are given, together with the refractive index and density. The table is particularly valuable since boiling points are given in many cases over a wide range of pressures, and data from various sources are inserted for purposes of comparison, together with references showing the actual source.

The work appears to be quite accurate and is as essential to any laboratory doing important research work in the field of organic chemistry as are the International Critical Tables.

In a work as comprehensive as this, it is inevitable that some mistakes should appear. For example, the index of refraction of 2,2,5-trimethyl hexane should be 1.3996, and the boiling point of 4,5-dimethyl octane should be 160–161 C. at 754 mm. The former is a typographical error and, in the latter case, the error was copied from a typographical error in *Chemisches Zentralblatt.* It would be helpful if future volumes would include errata for previous ones.

Copies of these volumes, I, $9.00, II, $12.00, can be ordered from the publishers.

Product Standards and Labeling for Consumers

A GREAT DEAL has been written and spoken on the subject of consumer goods and on consumer standards. Some of it has been well grounded while a great deal has been written by those not too familiar with facts and not versed in some of the fundamental principles involved. A new book on "Product Standards and Labeling

for Consumers" ($2.50) has been issued by The Ronald Press Co., 15 East 26th St., New York, N. Y., written by Miss Alice L. Edwards, who in her former capacity as Executive Secretary of the American Home Economics Association has had a great deal to do with consumer goods and has been intimately concerned with the development of standards. Consequently the book is not just a dissertation, but contains authoritative information.

It includes descriptions of the work of various organizations, including the A.S.T.M. The chapter headings indicate various divisions of the subject as follows: Standards: Stepping Stones in Progress; Tools of Industrial Conquest; Guides for Ultimate Consumers; Developing New Procedures; The Agriculturist's Friend; Guards for Public Protection; Simplification and Standards; Toward Fairness for All: With Common Interests; Industry in the Lead; From Both Sides of the Retail Counter; By Way of Illustration; Pointing the Way.

In the closing chapter on "Pointing the Way" the author lists various essentials or factors which must be part of a general pact in bringing various parties together. Some of these are: fair representation of all interested groups; full and objective consideration given to all pertinent data and situations; checks established to safeguard the integrity and soundness of standards before adoption; willingness to begin on simpler or less controversial items in a standard; provision for an adequate educational program; and provisions for revision of a standard when so desired.

We were rather forcibly struck by a quotation of Albert W. Whitney's, which follows:

"... When a body of sincere, well-meaning, understanding persons come together in the continuing presence of the truth, however diverse their interests may apparently be, a marvelous thing happens—a solution appears which is not a compromise, but which in the majority of cases is the best for all concerned."

It is similar to the statement made by the late beloved John A. Capp, Past-President, when he was awarded honorary membership in A.S.T.M.; in discussing studies of "human engineering" he said that the man who goes to any committee in the right spirit can nearly always accomplish anything, not what he wants, but what he ought to have.

Miss Edwards on the last page of her book has presented in two paragraphs probably the best review of it and expressed why the book should be of interest to all who are concerned with this growing movement of consumer standards development.

"Without doubt it is socially and economically important that all organizations in a position to further the development of sound and serviceable standards for retail commodities and merchandising practices should gain an understanding of how they may participate effectively in these programs and of the part they may each contribute to them. This applies not alone to various groups of consumers and technical agencies. It should extend to both large and small producers and manufacturers of all kinds of products. This diversity among participants is related to the extent to which all pertinent facts and issues are given consideration in arriving at decisions.

"Possibly, by study and comparison of the procedures and agencies as presented in preceding chapters, a large number of these organizations may be encouraged to assume a more active part in the standards program."

Availability of Oil Standards for Viscosimeter Calibration

Since quite a number of inquiries are received concerning the source of supply for oil standards for calibrating viscosimeters, the information given below is presented so that those who are interested will know where the material can be obtained. The American Petroleum Institute has two oil standards called "Alpha 40" and "Beta 40" which can be obtained from the office of Dr. T. G. Delbridge, The Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa., at a cost of $5 per quart sample. The viscosity values for these two samples are as follows:

	Alpha 40	*Beta 40*
Kinematic Viscosity		
100 F.	58.17 centistokes	395.7 centistokes
210 F.	7.69 centistokes	24.00 centistokes
Saybolt Viscosity (Converted by means of A.S.T.M. D 446 – 39)		
100 F.	269.0 sec.	1828 sec.
210 F.	51.3 sec.	115.4 sec.
Saybolt Furol Viscosity		
122 F.	....	88.8 sec.

These samples are carefully checked annually and corrections are applied if there is any change in their viscosity. These samples are satisfactory for the calibration of both Saybolt and kinematic viscosimeters at 100 F. and 210 F.

The National Bureau of Standards is also in a position to supply oil samples which have been calibrated at various temperatures from 20 C. to 100 C. These oils are also satisfactory for both Saybolt and kinematic viscosimeters. Details regarding cost and viscosity of samples may be obtained directly from the Bureau of Standards.

Conference on Soil Mechanics

The Conference on Soil Mechanics and Its Applications to be held at Purdue University, West Lafayette, Ind., September 2 to 6 incl., is under the auspices of the Committee on Foundations and Soil Mechanics, Civil Engineering Division of the Society for the Promotion of Engineering Education, and the School of Civil Engineering and Engineering Extension Dept. of Purdue University.

The announcement indicates that approximately fifty engineering schools in the United States and Canada now offer courses in soil mechanics or include extensive material on soil mechanics and soil testing in courses in foundations or highway engineering or both. Since the meetings of the First International Conference on Soil Mechanics and Foundation Engineering in 1936, there have been persistent requests from teachers and administrators of civil engineering courses for the organization of another conference.

The purpose of the conference is to provide opportunities for the discussion of the problems incident to the presentation of courses in soil mechanics; assistance toward individual solutions of these problems by means of assembled data and experience; authoritative discussions of basic subject matter in soil mechanics; and sources of reliable information on soil mechanics problems and criteria for the evaluation of new material as it becomes available.

New Chrysler Engineering Laboratories

THE DEDICATION of the two new engineering laboratories at Highland Park, Mich., was among the high spots of the Chrysler Corporation's celebration of its Fifteenth Anniversary, early in June. These new engineering facilities are significant from many respects and above all indicate the important place of engineering and science in the many fields covered by Chrysler activities, not only automotive, but air conditioning, etc. It is not possible adequately to describe the laboratories in the limited space available here. Their excellent publication "New Worlds in Engineering" is a portrayal of many of the laboratory features. They are figuratively the last word in layout and design and incorporate some of the finest technical and scientific testing and research equipment available, covering fields in which A.S.T.M. members are so concerned—ferrous and non-ferrous metallurgy, metallographic and spectrographic analysis, X-ray, aerodynamics, dynamometer testing, dynamic balancing, powder metallurgy, and other related problems.

The President of the Society was present at the exercises in connection with the dedication of the new laboratories.

Chrysler is very active in many phases of the Society's work. A number of the technologists hold personal membership including F. M. Zeder, E. W. Upham, and C. E. Heussner. The company also has a corporate membership represented by Mr. F. E. McCleary, Metallurgical Engineer, and recently has become a sustaining member, the representative being Mr. J. C. Zeder, Chief Engineer, Engineering Division. Mr. Heussner, especially, has been active in many phases of the Society's work.

Publication on Transportation Materials

EDITORIAL WORK is well under way on the seven papers comprising the Symposium on New Materials in Transportation held as part of the 1940 A.S.T.M. Spring Meeting in Detroit in March. These papers will be issued in a special publication comprising some 125 pages and will be available to members at special prices which will be announced in a prospectus being sent in a separate mailing.

There was a great deal of interest in the papers and the publication should be of interest to all who are concerned with the topics covered, which include the following: exhaust valve materials for internal combustion engines; selection and application of automotive steels; rubber of tomorrow; advances in the uses of concrete in transportation; recent developments in the use of asphalt for transportation purposes; trends in the properties of volatile liquid fuels; and developments in lubrication.

Calendar of Society Meetings

(Arranged in Chronological Order)

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Pacific Coast Convention, August 26–30, Los Angeles, Calif.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fall Meeting, September 3–6, Hotel Davenport, Spokane, Wash.; Annual Meeting, December 2–6, New York, N. Y.

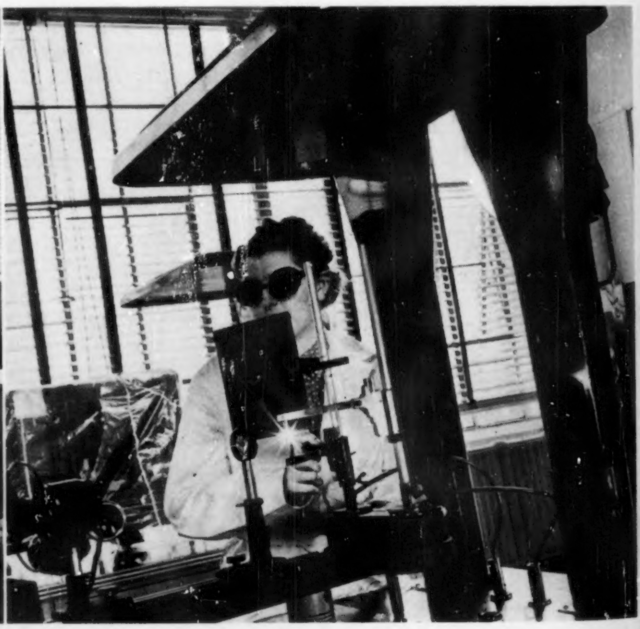
AMERICAN CHEMICAL SOCIETY—Fall Meeting, September 9–13 Detroit, Mich.

ASSOCIATION OF IRON AND STEEL ENGINEERS—Annual Convention and Iron and Steel Exposition, September 24–27, Stevens Hotel, Chicago, Ill.

NATIONAL SAFETY CONGRESS—October 7–11, Stevens Hotel, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS—Annual Dinner, October 14, Hotel Commodore, New York, N. Y.; Annual Meeting and Engineering Display, January 6–10, 1941, Book-Cadillac Hotel, Detroit, Mich.

HIGHWAY RESEARCH BOARD, NATIONAL RESEARCH COUNCIL—Twentieth Annual Meeting, December 4–6, National Academy of Sciences, Washington, D. C.

In the Chrysler laboratories: Left—Part of the lubricants testing and research laboratory; Right—Spectrographic analysis.

PERSONALS . . . News items concerning the activities of our members will be welcomed for inclusion in this column.

A. D. Eplett, formerly Development Engineer, Consolidated Ashcroft Hancock Co., Bridgeport, Conn., is now Chief Metallurgical Engineer, Manning, Maxwell & Moore, Inc., Bridgeport.

T. J. Evans has been advanced from Vice-President to President of The Evans Pipe Co., Uhrichsville, Ohio.

L. E. Barringer, Engineer in charge of Electrical Insulation, General Electric Co., Schenectady, N. Y., has been awarded the 1940 Benjamin G. Lamme Medal of Ohio State University, Columbus, Ohio, for "achievement in the field of research and development of materials for electrical insulation."

E. G. Fahlman, formerly General Manager, The Permold Co., Cleveland, Ohio, has been made President.

J. F. Greene is now Director of Research, Kimble Glass Co., Vineland, N. J. He was formerly Chemical Engineer.

Among the recipients of the 1940 awards of the Franklin Institute were the following A.S.T.M. members: *Edward Longstreth Medal*, for the encouragement of invention, to R. L. Templin, Chief Engineer of Tests, Aluminum Co. of America, for "the ingenious application of mechanisms resulting in the development of the Templin automatic autographic deformation recorder;" Maxwell M. Upson, President, Raymond Concrete Pile Co., New York, for "his contributions to the scientific development of foundation engineering and construction, characterized by genius for invention and technical skill." *The George R. Henderson Medal* for distinguished contributions in the field of railway engineering to W. E. Woodard, Vice-President, Lima Locomotive Works, Inc., New York, for "his accomplishments in locomotive engineering and his important contributions in the field of steam locomotive design."

R. M. Palmer, President, Ferro-Nil Corp., New York, N. Y., has been re-elected President of the Brown University Club of New York.

Horace Hoch, formerly Research Engineer, The McKay Co., York, Pa., is now Superintendent of this company.

In connection with the Detroit Meeting of the American Chemical Society, to be held September 9 to 13, W. P. Putnam, President, The Detroit Testing Laboratory is General Chairman of the local committee. C. F. Kettering, General Motors Corp., is Honorary Chairman.

W. H. Kershaw, who was Assistant General Sales Manager, is now Manager, Sales Department, The Texas Company, New York, N. Y.

P. V. McKinney, formerly Senior Industrial Fellow, Mellon Institute of Industrial Research, is now Director of Research, The Neville Co., Neville Island, Pittsburgh, Pa.

Gustav Egloff, Technical Director, Universal Oil Products Co., Chicago, Ill., has been awarded the medal of the American Institute of Chemists, presented annually for outstanding service to the science of chemistry and the profession of chemist in America. R. W. Vose, formerly Instructor in Charge, Materials Laboratory, Harvard University, Cambridge, Mass., is now Director of Research, Chicopee Manufacturing Corp., Chicopee Falls, Mass.

L. T. Work, who was Assistant Professor of Chemical Engineering, Columbia University, is now Director of Research and Development, Metal and Thermit Corp., Carteret, N. J.

E. C. Ludwig is now Manager, National Bearing Metals Corp., Chicago, Ill. Formerly he was Chief Metallurgical Engineer with offices in St. Louis, Mo.

The American Section of the Society of Chemical Industry has elected L. T. Work, Director of Research and Development, Metal and Thermit Corp., and Foster Dee Snell, President, Foster D. Snell, Inc., chairman and vice-chairman, respectively.

Ira Paul, formerly Associate Laboratory Engineer, is now Director, Public Works Laboratory, New York State Department of Public Works, Division of Engineering, Albany, N. Y.

M. R. Kavanaugh, who was General Manager, Oliver Iron and Steel Corp., Pittsburgh, Pa., has become Vice-President of this company.

At a meeting of the nominating committee of the American Society for Metals, held in May, O. E. Harder, Assistant Director, Battelle Memorial Institute, Columbus, Ohio, was nominated for President; and Bradley Stoughton, Director of Metallurgical Engineering and Dean, College of Engineering, Lehigh University, Bethlehem, Pa., is the nominee for Vice-President.

J. H. Herron, President, The James H. Herron Co., and Consulting Engineer, Cleveland, Ohio, has been made an honorary member of the Cleveland Engineering Society.

E. T. Longstreth, President, Samuel H. French and Co., Philadelphia, has announced that his company, after 96 years in the present location at the S. W. Corner of Fourth and Callowhill Sts., will move to 475–77 York St.

T. A. Boyd, Head, Fuel Department, Research Laboratories Division, General Motors Corp., recently received the 1939 Lamme Medal, awarded annually by Ohio State University to one of its graduates for "meritorious achievement in engineering."

R. G. Bowman, formerly Test Engineer, Seversky Aircraft Corp., is now Director of Research, Republic Aviation Corp, Farmingdale, Long Island, N. Y.

F. L. Plummer is now connected with the Hammond Iron Works, Warren, Pa., as Research Engineer. He was associated with the Cuyahoga County Bridge Dept., Cleveland, Ohio.

G. A. Lux is with the National Bureau of Standards, Washington, D. C., as Research Associate, American Electroplaters Society.

A. R. Dimock, Jr., formerly Junior Civil Engineer, Southern States Power Co., is now Valuation Engineer, Ebasco Services, Inc., New York, N. Y.

G. G. Brown, Professor of Chemical Engineering, University of Michigan, was the recipient of the Hanlon Award of the Natural Gasoline Association of America, the award being established for outstanding contributions in the field of natural gasoline. D. W. Edgerly, who was connected with the Titanium Pigment Corp., St. Louis, Mo., as Western Sales Manager, is now Vice-President of this company, and located in Chicago, Ill.

A. C. Eide, formerly Sales Engineer, is now Manager, Pigment Division, American Zinc Sales Co., Columbus, Ohio.

H. H. Lind has been made President, American Institute of Bolt, Nut and Rivet Manufacturers, Cleveland, Ohio. He was formerly Vice-President.

Byron Bird is now Senior Engineer, U. S. Engineer Office, Washington, D. C. Formerly he was Hydraulic and Sanitary Engineer.

W. H. Gardner, Research Fellow, Polytechnic Institute of Brooklyn, was elected chairman of the New York Chapter of The American Institute of Chemists at its recent business meeting.

C. C. Blair formerly Vice-President and Manager of Sales, is now President, Metropolitan Paving Brick Co., Canton, Ohio.

J. G. Bragg has been made Assistant to the President, Alpha Portland Cement Co., Easton, Pa. For a number of years Mr. Bragg has been General Sales Manager.

At the annual convention of the American Foundrymen's Association, L. N. Shannon, Vice-President, Stockham Pipe Fittings Co., Birmingham, Ala., was chosen President and H. J. Roast, Vice-President, Canadian Bronze Co., Montreal, Canada, a Director, W. H. Romanoff, Technical Superintendent, H. Kramer & Co., Chicago, Ill., was chosen Vice-Chairman of the Non-Ferrous Division. The J. H. Whiting Gold Medal was awarded to F. K. Vial, Director and Vice-President, Griffin Wheel Co., Chicago, and Director and Vice-President in Charge of Research, Association of Manufacturers of Chilled Car Wheels, Chicago, and the W. H. McFadden Gold Medal to H. W. Dietert, President, Harry W. Dietert Co., Detroit.

E. E. Duque, formerly Secretary and General Manager, is now President, California Portland Cement Co., Los Angeles, Calif.

NEW MEMBERS TO JULY 15, 1940

The following 93 members were elected from April 25 to July 15, 1940, making the total membership 4349:

Company Members (33)

ADIRONDACK FOUNDRIES AND STEEL, INC., C. L. Richards, Metallurgist, Watervliet, N. Y.

*APEX SMELTING CO., G. H. Starmann, Vice-President, 2537 W. Taylor St., Chicago, Ill.

ATLAS MINERAL PRODUCTS CO. OF PENNSYLVANIA, THE, C. R. Payne, Vice-President and Director of Research, Mertztown, Pa.

CALLENDER'S CABLE AND CONSTRUCTION CO., H. J. Allcock, Anchor Works, Leigh, Lancashire, England.

CARBOLOY CO., INC., E. W. Engle, Box 239, Roosevelt Park Annex, Detroit, Mich.

*CATERPILLAR TRACTOR CO., C. G. A. Rosen, Assistant Chief Engineer, Peoria, Ill.

CELOTEX CORP., THE, Wallace Waterfall, Director of Research Engineering, 919 N. Michigan Ave., Chicago, Ill.

*CHICAGO BRIDGE AND IRON CO., George Terry Horton, President, 1305 W. 105th St., Chicago, Ill.

CHRYSLER CORP., J. C. Zeder, Chief Engineer, Engineering Division, 12800 Oakland Ave., Detroit, Mich.

CLEVELAND QUARRIES CO., THE, W. M. Jones, Assistant Vice-President, 834 Woodward Building, Washington, D. C.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE, H. N. Boetcher, Assistant to Superintendent, Power Production Stations, Lexington Building, Baltimore, Md.

**COPPERWELD STEEL CO., L. C. Whitney, Chief Metallurgist, Ninth St. and Allegheny Ave., Glassport, Pa.

CUMMINS ENGINE CO., H. H. Lurie, Metallurgist, Columbus, Ind.

FAIRBANKS CO., THE, E. T. Adams, Chief Mechanical Engineer, Binghamton, N. Y.

FEDERAL FIBRE MILLS, P. H. Santmyer, Assistant Superintendent, Box 1706, New Orleans, La.

*FORSTMANN WOOLEN CO., Werner von Bergen, Chief Chemist, Passaic, N. J.

HAASE CO., INC., WILBERT W., A. D. Kahn, National Field Representative, 1015 Troost Ave., Forest Park, Ill.

INDUSTRIAL TESTING LABORATORY, R. M. Snyder, Director, 930 Wyandotte St., Kansas City, Mo.

INSULATION BOARD INST., P. D. Close, Technical Secretary, 111 W. Washington St., Chicago, Ill.

KIMBLE GLASS CO., J. J. Moran, Technical Manager, Sales Dept., Vineland, N. J.

MARTIN CO., GLENN L., R. B. Gray, Chief of Laboratories, Baltimore, Md.

MCKEE GLASS CO., E. B. Stern, Sales Dept., Jeannette, Pa.

MCPHERSON'S PROPRIETORY, LTD., R. Fiddy, 546 Collins St., Melbourne, C. 1, Australia.

NATIONAL PAINT, VARNISH AND LACQUER ASSN., INC., Henry A. Gardner, Director, Scientific Section, 1500 Rhode Island Ave., N. W., Washington, D. C.

PENNIMAN & BROWNE, 341 St. Paul Place, Baltimore, Md.

PENNSYLVANIA RAILROAD CO., THE, C. D. Young, Vice-President, Broad Street Station, Philadelphia, Pa.

PERMANENTE CORP., THE, H. P. Davis, General Superintendent, Box 29, San Jose, Calif.

RAMLEH ELECTRIC RAILWAY, Le Directeur, Box 466, Alexandria, Egypt.

SOLAR AIRCRAFT CO., H. A. Campbell, Research Engineer, Lindbergh Field, San Diego, Calif.

STANDARD LIME AND STONE CO., L. W. Chantler, Chief Chemist, Millville, Jefferson County, W. Va.

*TITANIUM ALLOY MANUFACTURING CO., THE, G. F. Comstock, Metallurgist, 967 Harrison Ave., Niagara Falls, N. Y.

VULTEE AIRCRAFT, INC., Scott Rethorst, Process Engineer, 842 Lakewood Boulevard, Downey, Calif.

WILSON CO., THE H. A., R. G. Waltenberg, Chief Engineer, 105 Chestnut St., Newark, N. J.

* See article on Sustaining Members, p. 41.
** See article on Sustaining Members, May ASTM BULLETIN, p. 39.

Individual and Other Members (56)

AKERS, T. E., Sales Engineer, Highway Products Division, T. L. Herbert and Sons, 174 Third Ave. North, Nashville, Tenn.

ALLISON, C. F., Metallurgist, Aliquippa Works, Jones & Laughlin Steel Corp., Aliquippa, Pa.

BERGEN, FRED, Superintendent, The National Refining Co., Findlay, Ohio.

BIGET, M., Chef de la Division du Controle des Fabrications, Société Nationale des Chemins de Fer Français, 100 Avenue de Suffren, Paris 15e, France.

BLY, J. H., Radiographer and X-ray Diffractionist, Materials Laboratory, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.

BUCK, H. J., Sales Engineer, Allied Materials Corp., Oklahoma City, Okla. For mail: 936 Victoria, Kirkwood, Mo.

CABANISS, W. M., Superintendent, Signal Mountain Portland Cement Co., Chattanooga, Tenn.

CINCINNATI, CITY OF, ENGINEERING DIVISION, H. H. Kranz, City Engineer, 321 City Hall, Cincinnati, Ohio.

COWAN, G. H., President, CopperCote, Inc., 331 Madison Ave., New York City.

CRIBB, V. N., Experimental Engineer, Williams Oil-O-Matic Heating Corp., Bloomington, Ill. For mail: 1021 E. Washington St., Bloomington, Ill.

CROWLEY, D. A., Chief Inspector, Carnegie-Illinois Steel Corp., Pittsburgh, Pa. For mail: 405 Hillview St., Duquesne, Pa.

DRAKE, H. C., Director of Research, Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J.

EAGAN, T. E., Chief Metallurgist, The Cooper-Bessemer Corp., Grove City, Pa.

ECHOLS, P. P., Chief Metallurgist, Republic Steel Corp., Warren, Ohio.

ENCK, E. G., Chemical Director, Foote Mineral Co., Philadelphia, Pa. For mail: "Tail Winds," Gwynedd Valley, Pa.

ERVIN, E. A., Manager, Ervin and Co., 2800 N. Hancock St., Philadelphia, Pa.

FLOYD, P. E., District Sales Manager, Allegheny Ludlum Steel Corp., 4747 S. Kedzie Ave., Chicago, Ill.

GEYER, C. O., Chief Chemist, Inland Steel Co., East Chicago, Ind.

GIBSON, J. K., Secretary to President and General Manager, Simons Brick Co., 1195 S. Boyle Ave., Los Angeles, Calif.

GOICOECHEA, MANUEL, Consulting Engineer, Napoles 17, Mexico, D. F., Mexico.

GRAVES, H. C., JR., Engineering Manager, I. T. E. Circuit Breaker Co., 501 N. Nineteenth St., Philadelphia, Pa.

GUTHMAN, E. I., President, Edwin I. Guthman and Co., Inc., 400 S. Peoria St., Chicago, Ill.

HÅKANSON, PER SIGURD, Chief Chemist, Skånska Cement A.-B., Limhamn, Sweden.

HAMRE, R. T., Arch Representative and Sales Manager, Buckingham-Virginia Slate Corp., 1103 E. Main St., Richmond, Va.

HARVARD UNIVERSITY, GRADUATE SCHOOL OF ENGINEERING, LIBRARY, Natalie Nicholson, Librarian, Rotch Building, Cambridge, Mass.

HOUGHTEN, F. C., Director of Research, American Society of Heating and Ventilating Engineers, Research Laboratory, 4800 Forbes St., Pittsburgh, Pa.

HOWARD, ERNEST, Engineer, The H. A. Wilson Co., 105 Chestnut St., Newark, N. J.

JOHNSON, E. L., Vice-President, Concrete Conduit Co., Ltd., Box 129, Colton, Calif.

KAYE, HARRY, Director of Laboratory, United Cigar-Whelan Stores Corp., 82 Thirty-ninth St., Brooklyn, N. Y.

KNICKERBOCKER, C. J., Chief Chemist, Consolidated Cement Corp., Fredonia, Kans.

KNODE, G. H., Engineer, Test Dept., The Pennsylvania Railroad Co., Altoona, Pa. For mail: 2903 Broad Ave., Altoona, Pa.

LANDON, R. D., Professor, Southern M[illegible]list University, Dallas, Tex. For mail: 3209 Greenbrier Drive, Dallas, Tex.

LOOS, C. E., Manager, Structural and Plate Bureau, Metallurgical Division, Carnegie-Illinois Steel Corp., Frick Annex Building, Pittsburgh, Pa.

MACKERT, G. E., Superintendent, J. Eavenson and Sons, Division of Wilson and Co., Inc., Delaware Ave. and Penn St., Camden, N. J.

MCBEATH, J. A., Proprietor, J. A. McBeath and Sons, Bedford, Ind. For mail: 3631 Everett St., N. W., Washington, D. C.

Michell, W. P., Manager, Engineering Dept., Mack Manufacturing Corp., Allentown, Pa.

Mullaly, A. B., Sales Engineer, Advance Solvents and Chemical Corp., New York City. For mail: 415 Buttermere Ave., Interlaken, N. J.

Mundt, H. W., Concrete Technician, The Panama Canal, Balboa Heights, Canal Zone. For mail: Box 52, Diablo Heights, Canal Zone.

Otto, H. S., President, Chemical Improvements, Inc., 18 E. Forty-first St., New York City.

Payne, Ruth, Chemist-Spectrographer, American Electro-Metal Corp., 320 Yonkers Ave., Yonkers, N. Y.

Perrette, George, Metallurgist, Titusville Forge Co., Titusville, Pa.

Prosser, W. R., Jr., Chemical Director, Kirkman and Son, Inc., 215 Water St., Brooklyn, N. Y.

Read, H. S., Physicist, Spectrographic and X-ray Laboratories, Wright Aeronautical Corp., Paterson, N. J. For mail: 815 Embree Crescent, Westfield, N. J.

Rolnick, H. A., Director, Trent Engineering Laboratories, 316 N. Twenty-second St., Philadelphia, Pa.

Rose, H. J., Senior Industrial Fellow, Mellon Institute of Industrial Research, 4400 Fifth Ave., Pittsburgh, Pa.

Schalscha, W. G., Works Manager, Lidgerwood Manufacturing Co., Elizabeth, N. J. For mail: 72 Farley Road, Millburn, N. J.

Shepard, S. W., Metallurgist, Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.

Smith, C. A., Secretary-Treasurer and General Manager, North Bangor Slate Co., 209 Broadway, Bangor, Pa.

Stewart, W. E., Assistant to Vice-President, Treadwell Construction Co., Box 144, Midland, Pa.

Swain, S. M., Ceramic Engineer, North American Refractories Co., 1012 National City Bank Building, Cleveland, Ohio.

Talbot, A. B., Vice-President Colprovia Roads, Inc., 801 Second Ave., New York City.

Train, Fred, Director, John Bright and Brothers, Ltd., Rochdale, England. For mail: Knowsley, Heights Lane, Rochdale, England.

Vaughan, E. W., Chief Soil Technician, The Panama Canal, Box 21, Balboa Heights, Canal Zone.

Viscardi, J. E., Engineer, In Charge of Physical Testing, Monsanto Chemical Co., Springfield, Mass.

Von Blon, W. R., Associate Chemist, Veterans Administration, Washington, D. C. For mail: 30 Eighteenth St., S. E., Washington, D. C.

Warlow-Davies, E. J., Research Assistant, Engineering Section, London Midland & Scottish Railway Co., London Road, Derby, England.

Junior Members (4)

Faud, R. H., In Charge of Testing Laboratory, The Hankins Container Co., Cleveland, Ohio. For mail: 1607 Parkwood Road, Lakewood, Ohio.

Lepper, H. A., Jr., Instructor in Civil Engineering, Yale University, New Haven, Conn. For mail: 51 Prospect St., New Haven, Conn.

Mayshar, F. J., American Thread Co., Willimantic, Conn. For mail: 24 Ashland St., Willimantic, Conn.

Newton, J. V., Metallurgist, Anaconda American Brass, Ltd., New Toronto, Ont., Canada. For mail: 172 Oakmount Road, Toronto, Ont., Canada.

NECROLOGY

We announce with regret the death of the following five members:

J. M. McKinley, Vice-President, North American Refractories Co., Cleveland, Ohio. Member since 1917. Mr. McKinley had been a member of Committee C-8 on Refractories since 1929 and served on Subcommittee VI on Nomenclature.

E. W. Reed-Lewis, Research Engineer, Detroit, Mich. Member since 1935. Mr. Reed-Lewis was a member of Committee C-1 on Cement and served as Chairman of the Working Committee on Fineness.

Max F. Wirtz, President, The Atlas Mineral Products Co. of Pennsylvania, Mertztown, Pa. At the time of his death Mr. Wirtz was a member of Committee D-8 on Bituminous Waterproofing and Roofing Materials, having served since 1931.

Alvah Horton Sabin, Flushing, N. Y. One of the oldest members of the Society, Mr. Sabin had been a member continuously since 1898. At the time of his death he was 89 years of age. A very prominent technologist in the paint and preservative coatings field, he had for a great many years until his retirement been connected with the National Lead Co. He was active in the work of Committee D-1 on Paint, Varnish, Lacquer, and Related Products and had been a member of several of its subcommittees. At the time of his death he was serving on Subcommittee IX on Varnish.

Arthur N. Johnson, Dean Emeritus, College of Engineering, University of Maryland, College Park, Md. A long-time member of the Society, his affiliation dating since 1903, he was 69 years of age. He was very active in Society work. He was one of the founder members of Committee D-4 on Road and Paving Materials and had served continuously since 1903. He was first secretary of the committee, serving until 1908. He also served a six-year term as a member of Committee E-6 on Papers and Publications and was active in other phases of the Society's work.

Catalogs and Literature Received

Fisher Scientific Co., 711–723 Forbes St., Pittsburgh, Pa. An eight-page folder, "Castaloy Laboratory Appliances," describing Castaloy Burette Support, Utility Clamps, Extension Clamps, Swivel Clamp Holders, etc. Illustrated.

George Scherr Co., Inc., 128 Lafayette St., New York, N. Y. A seven-page publication entitled "The Control of Speed," a new catalog devoted to hand tachometers, speed indicators, cutmeters, and other types of speed-measuring equipment and instruments used for measuring revolutions per minute of electric motors, machinery, engines, lathes, pumps, Diesel engines, elevators, etc. Illustrated.

Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa. A 40-page catalog, N-33A(6), entitled "Thermocouples"—the first complete publication on thermocouples issued by Leeds & Northrup Co., not only lists a comprehensive line of assemblies with their parts and accessories, but includes information of general usefulness on the correct choice of couples. Tabulated in easy-to-use form, this information should be helpful to users as a guide to the best choice of couple for the application at hand. Illustrations and listings are so arranged that parts and accessories, as well as complete assemblies, are easily identified.

Burling Instrument Co., 241 Springfield Ave., Newark, N. J. A two-page folder, "Heat Controls," describes and illustrates four models.

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